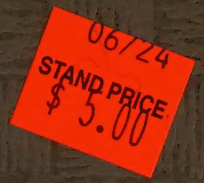
THE BOOK OF THE STARS

FOR YOUNG PEOPLE

WILLIAM TYLER OLCOTT


06/24
STAND PRICE
$ 3.00

THE BOOK OF THE STARS FOR YOUNG PEOPLE

The Fates Gathering in the Stars

By Elihu Vedder

Friends of American Art Collection

Copyright by The Art Institute of Chicago

THE BOOK OF THE STARS FOR YOUNG PEOPLE

393

BY

WILLIAM TYLER OLCOTT

AUTHOR OF "STAR LORE OF ALL AGES,"
"A FIELD BOOK OF THE STARS," ETC.

"Why did no one teach me the constellations when I was a child."—CARLYLE.

ILLUSTRATED

G. P. Putnam's Sons
New York & London
The Knickerbocker Press

Copyright, 1923
by
William Tyler Olcott

First printing, March, 1923
Second printing, July, 1925
Third printing, January, 1927
Fourth printing, August, 1928
Fifth printing, November, 1929

1811

Made in the United States of America

Here is life's secret,
Keep the upward glance,
Remember Aries is your relative,
The Moon's your uncle,
And those twinkling things,
Your sisters and your cousins and your aunts.

HAGEDORN.

INTRODUCTION

Twinkle, twinkle, little star
How I wonder what you are
Up above the world so high,
Like a diamond in the sky.

You are all familiar with this rhyme which so well expresses the wonder of the child, and grown-ups, too, when they chance to look up at the clear night sky gleaming with its beautiful jewels that twinkle a welcome to Starland to all mankind.

As the view of the lights of a distant city cheers the heart of the traveler journeying homeward, and as he rejoices at the sight of one well known light after another, so a knowledge of the names of the stars gives pleasure to those familiar with them, as they see their friendly beams emerging from the deepening shades of twilight.

In introducing you, so to speak, to the stars, I propose to tell you their story and show you how to find the bright ones in order that you may enjoy their friendship and learn to love them.

You who love the flowers will find the stars equally beautiful and lovable, for they, too, are many colored, and although they lack the fragrance of the flowers they bloom for us in the winter when all the

fields and woods have lost their loveliness. In wandering through the starry fields you see a garden of perpetual blooms that never cease to charm and delight you.

It is my wish in this book to blaze a trail for you among the stars in order that you may know your way about in the night sky and easily come to know the many objects of beauty and interest that darkness reveals to us.

When you go out of doors on a clear night, when the moon is not shining, you see the sky dotted with gleaming points of light.

> Look how the floor of heaven
> Is thick inlaid with patines of bright gold.

Some are as brilliant as the brightest jewels, while others are so dim and faint we can scarcely see them. They are scattered all over the sky like little pin pricks in a great black curtain through which we see the gleam of a beautiful land of golden light beyond.

Thousands of years ago these same stars looked down upon this old earth of ours, and in a land far off in the East there were shepherds who spent the night on the hillsides guarding their flocks. These shepherds used to gaze up at the stars with the same wonder with which we look at them, and for want of something better to do during their long night watches they named the stars and made pictures out of them to which also they gave names. Is it not interesting to realize that we still know the stars by

these very old names that were given to them thousands of years ago by the shepherds of a far distant land?

Many of you, I feel sure, have watched the clouds in the summer time as they drifted slowly across the blue sky, for all the world like huge white birds or boats. Borne along, by the gentle breezes they lazily sailed along and as you gazed at them you saw their edges form to your fancy quaint and curious faces and figures and animals, strange and well-known, and possibly you saw in the changing folds of the fleecy clouds the towers, and domes, and minarets of mighty cities.

It is not remarkable, therefore, that the shepherds of old, peering upward, should have traced star-pictures on the wonderful curtain of the night and that they should fancy that they saw huge giants and monsters in the starry skies. Presently they began to make up tales concerning the stars and in time each star and group of stars had an interesting story for them.

You know how hard it is for us to see the same cloud-picture that another person imagines and calls our attention to; it is equally difficult for us to trace the star-pictures handed down to us by the shepherds of old. After a time, however, when we have gazed at the stars many nights we get a glimpse now and then of these time-honored figures, and then we have them to delight and charm us all the rest of our lives.

As you look at the stars night by night you will see

them move apparently from east to west just as the sun seems to do. More stars are ever appearing as we gaze out over the eastern hills, and thus, in addition to a beautiful puzzle picture for your enjoyment, you have in the stars the most wonderful movie that the world has ever seen unfolding before your eyes each fair night. The scenario, or story of this movie, is the one it is my pleasure to tell you about in this book.

First of all, I am going to furnish you with a guide who will help you to find the stars I shall tell you about. He is a guide with four very good points and everyone is grateful to him for the help he gives them when they are lost and in doubt which way to go. The guide's name is "Compass," and his four good points are called "North," "East," "South," and "West." If you will learn these "points of the compass," as they are called, you will always be able to find your way about by night or day wherever you may happen to be.

It is very easy to find these four points. In the early morning you will always find the sun in the east if it is clear, and at sunset the sun will be seen in the west. If you stand with your right arm stretched out toward the east and your left arm toward the west, straight in front of you will be the north point, while directly back of you will be the south point.

Try this plan and see how easily you have found the points of our ever faithful guide the compass. When I ask you to face any of these four points you

will know just which way to stand to see the object I wish to call your attention to. Later I will tell you how to find the points of the compass at night when you do not have the sun to guide you.

I think it is best to locate each star-picture in the sky for you in turn, and then tell you its story, so that after you have come to know the picture and can name the stars in it, you can read what men of old times wrote about them. Just as after visiting strange lands and cities you find a pleasure in reading the history concerning them.

I have already told you that the stars appear to be in motion; we have therefore a slowly ever-changing moving picture thrown on the sky-screen, and it makes a difference at what time of the year we go out to look at the sky movies as to what picture we will see, for every season of the year has its own star-pictures. For this reason I will arrange the star-pictures by seasons in order that you may take up the study of them at any time.

A few of the star-pictures can be seen at any time of the year, but as they seem to be slowly turning on a great round screen, sometimes the pictures will appear to be upright and at other times they seem to be upside down, which makes them hard to puzzle out.

To get the best view of the first star-picture I shall show you we must go out of doors some night in the Autumn, say at nine o'clock October 15th, eight o'clock November 1st, or seven o'clock November 15th. There is no need to be exact as to time

and date, only remember that the later in the Fall it is, the earlier you must go out of doors to see the star-picture right side up.

If you wish to see this picture at some other time of the year, simply look first at the sketch I will give you of the different positions the picture assumes each season to get the proper view of the star-picture at the season of the year that it may happen to be.

As for the names of the star-pictures, I will first give you the Latin name, the one astronomers use, which it is well for you to know, then I will add the better known or common name, which you will no doubt like best because it is easier to pronounce and remember, and, for the most part, these names describe the pictures. Now for the first picture!

THE DIAGRAMS OF THE STAR-PICTURES

You will find the Star-Pictures in this book arranged according to the seasons; this is because each season has its own pictures, and some are better placed for observing than others. For this reason a plan of study is necessary. The pictures are arranged as they appear in the sky at 8 P.M. in mid-season, in a favorable position for observing.

The star-pictures of the Great and Little Bears, because of their importance, are described at the beginning of each season, in order that they may be the first pictures viewed, regardless of the time of the year that a study of them is taken up.

In beginning work in any season, first consult the large plate showing the view of the whole sky as it appears on the given date. In these plates you are supposed to be looking south. By turning the plate about from left to right you will obtain the correct view of the eastern, northern, and western skies successively.

The figures on the star-pictures that appear close to the dots representing the stars designate the magnitude of the stars. By the expression "the magnitude of a star" is meant its brightness. A star of the second magnitude is two and one-half

times brighter than a third magnitude star, and this is the degree of brightness of each successive magnitude. Stars below the sixth magnitude are invisible to the naked eye.

The positions of the wonderful objects in the sky known as Star Clusters are indicated on many of the pictures by a little circle of dots, close to which is a capital letter preceded by a number. The letter is the initial letter of the astronomer Messier who catalogued these objects, and the figure is his catalogue number.

CONTENTS

	PAGE
Introduction	vii
The Diagrams of the Star-Pictures	xiii
The Star-Pictures of Autumn	1
Map of the Heavens at 9 p.m. October First	2
Ursa Major	5
Diagram Showing Seasonal Changes in Position of the Dipper	7
Ursa Minor	19
Diagram of Daily Path of Little Bear	22
Cassiopeia	29
Cepheus	37
Draco	45
Diagram Showing Eastern and Northeastern Sky in Mid-Autumn	51
Auriga	55
Perseus	63
Andromeda	71
Aries	81
Pisces	89

PAGE

THE MILKY WAY 343

THE ZODIAC 351

THE PLANETS 355

DIAGRAM ILLUSTRATING THE MOON'S PHASES . 372

DIAGRAM SHOWING THE ORBITS OF THE PLANETS . 385

DIAGRAM SHOWING THE SIZE OF THE PLANETS . 386

APPENDIX 389

INDEX OF CONSTELLATIONS 397

INDEX 399

ILLUSTRATIONS

PAGE

THE FATES GATHERING IN THE STARS *Frontispiece*
By Elihu Vedder. Friends of American Art Collection

ASTRONOMY AND GEOGRAPHY 12
From a mural painting by Will H. Low, in the New York State Education Building, Albany

THE FORGE OF VULCAN 58
In the Ducal Palace, Venice.
Photo by Anderson

PERSEUS AND MEDUSA 66
Bronze by Cellini at Florence
Photo by Brogi

PERSEUS AND ANDROMEDA 74
(Berlin)
Photo by Hanfstaengl

THE RAPE OF EUROPA 98
Painting by Veronese. In the Ducal Palace, Venice
Photo by Naya

THE DANCE OF THE PLEIADES . . . 112
Painting by Elihu Vedder

GANYMEDE 128
Painting by George Frederick Watts
Photo by Hollyer

ILLUSTRATIONS

PAGE

PHAËTHON DRIVING THE CHARIOT OF APOLLO . 202
Painting by Max Klepper

BERENICE 228
Bronze Bust in National Museum, Naples
Photo by Brogi

THE MINOTAUR 232
Painting by George Frederick Watts

THE INFANT HERCULES STRANGLING THE SERPENTS AT POMPEII 238
Photo by Brogi

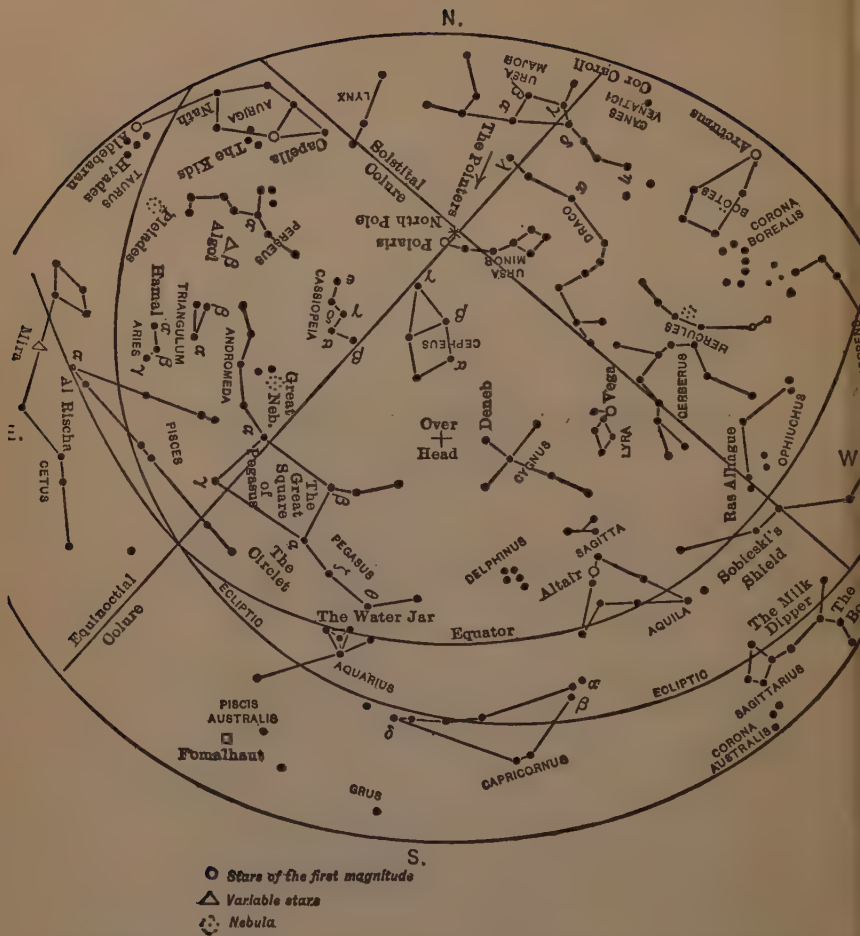
HERCULES AND THE HYDRA 274
Uffizi Gallery at Florence
Photo by Anderson

ORPHEUS AND EURYDICE 292
Villa Albani, Rome
Photo by Anderson

CUPID AND DOLPHIN 312
National Museum, Naples
Photo by Brogi

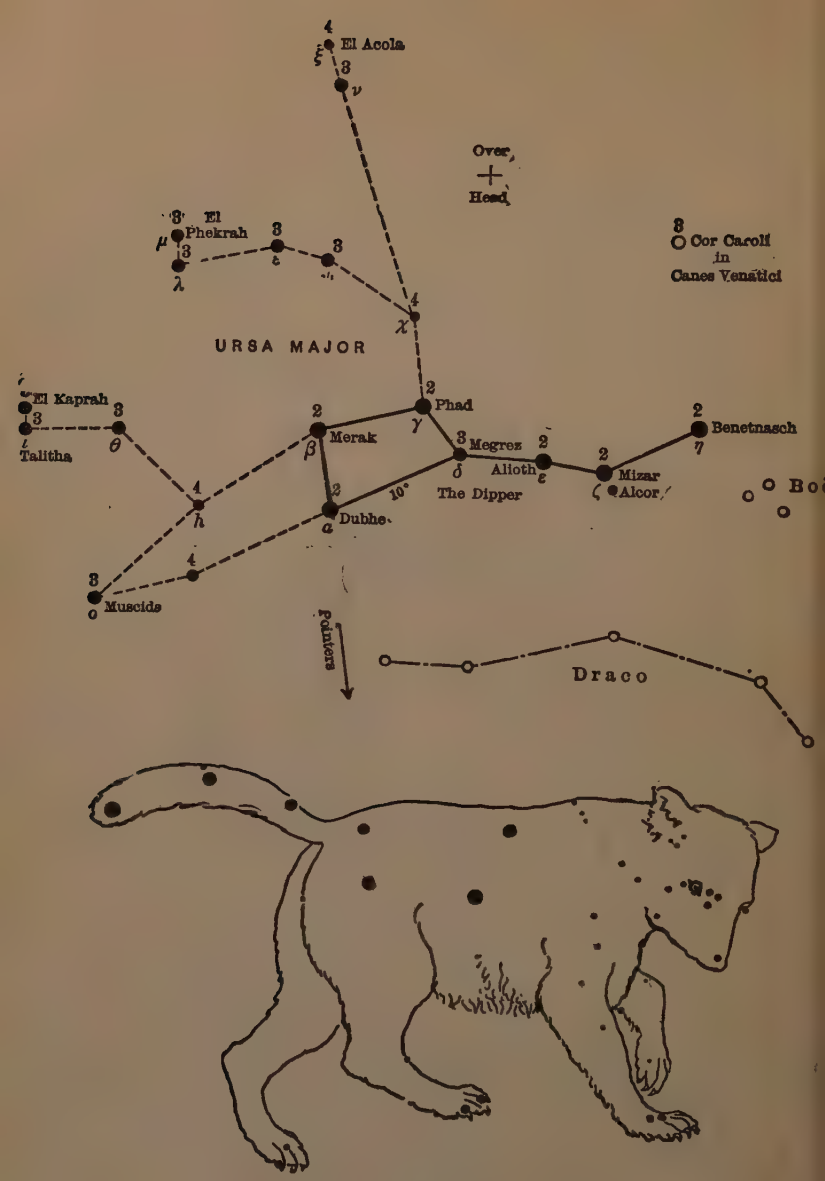
LAOCOÖN 322
Museum of Vatican, Rome
Photo by Anderson

THE STAR-PICTURES OF AUTUMN



Map showing the principal stars visible from Lat. 40° N. at 9 o'clock, October firs

URSA MAJOR
THE GREAT BEAR


El Acola
Over Head
Cor Caroli in Canes Venatici
El Phekrah
URSA MAJOR
El Kaprah
Talitha
Phad
Merak
Megrez
Alioth
Mizar
Alcor
Benetnasch
The Dipper
Dubhe
Muscida
Pointers
Draco

URSA MAJOR

URSA MAJOR (er'sa mā-jor)—THE GREAT BEAR. (Face North.)

"He who would scan the figured skies
Its brightest gems to tell
Must first direct the mind's eye north
And learn the Bear's stars well."

LET us go out in the garden or to some place where we can get a good view of the stars near the horizon and look for the star-picture that is the oldest, the best known, and the easiest to find, the picture that the shepherds of the olden time in the far East, and the ancestors of our own American Indians in the far West both called the "Great Bear."

A much better name for this picture, and the name it is best known by to-day is the "Dipper," because, if you draw imaginary lines connecting the stars in this figure, you will see that your sketch looks not unlike a water dipper with a crooked handle. Instead, therefore, of looking for the picture of a bear in the sky we will search for a star-picture that looks like a dipper, a figure similar to the one sketched on the following page.

I will ask you to face north, for our picture is low down on the northern sky screen and it is one of the

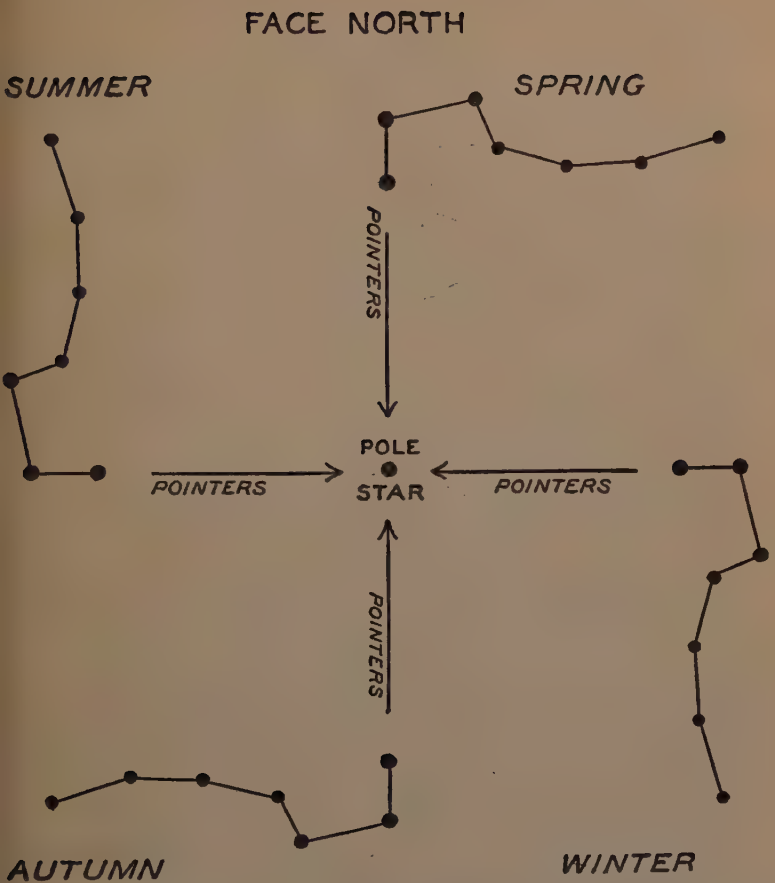
few star-pictures that are always to be found in this part of the sky.

Now look for seven fairly bright stars of almost equal brightness low down in the sky that resemble the figure of the dipper pictured in the sketch. I feel

sure that you will see this at once, for the picture attracts our attention as soon as we look at the northern sky where there are few very bright stars. I must take it for granted that you have now seen your first star-picture.

It is hard to believe that the picture is slowly turning, and yet if you will come out later to-night you will see at once that it has done so, or if you cannot sit up so late go out with me a few nights later at the same time that we went out to-night and you will see that our picture has moved to the right (that is to the east) quite a bit. In the course of a month the movement is very marked. The stars themselves do not change their positions but the whole picture moves in a circle. Therefore the Dipper appears in different positions in the early evening at different seasons of the year, as you will see by looking at the following sketch.

Once in every twenty-four hours the star-picture of the Dipper makes a complete circle around a



The positions assumed by the Dipper or Great Bear in the early evening each season.

central point called the "Pole," just as the horses in a merry-go-round circle about a central point where the hurdy-gurdy is usually located. The reason we do not see this circle completed by the Dipper is that when the sun rises its light is so bright that we cannot see the star-pictures, but they are there all the time on the screen. You see, the lights in the theatre have been turned up and we cannot see the movie because the lights are too bright for us to do so.

You are quite sure to ask me why the star-pictures turn. It is because the earth is the operator of the moving-picture machine, and he makes the pictures appear to move in a circle; but in this book I am to tell you about the star-pictures and how to find them. As for a description of the moving-picture machine, that is another story which you can read later in other books when you know all the star-pictures and the stories concerning them.

Now that you know the Dipper, let us see if we cannot trace out the time-honored figure of the Bear, and to do this you must turn back and look at the picture of the Bear that has been drawn for you. I might say here that it is a good plan when you go out to study the star-pictures, to take with you a small electric pocket flashlight to enable you to see the pictures in the book with which to compare the star-pictures in the sky.

With the help of the picture, and a little imagination, I think you will be able to see the Bear that has been inhabiting the sky-zoo for so many ages. He is really a huge bear with a long tail, and you will be

apt to tell me that bears do not have long tails; but this one is a star-bear, you know, and they are different—this one is anyway. Later I will tell you how he came to have such a long tail.

There are three little pairs of stars that mark three of the Bear's four paws. It is quite likely that at this season of the year you will not be able to see the paws of the Bear early in the evening, but later on, as the picture turns, the Bear climbs up the sky and you can see all of his massive figure. In the early evening, in spring, he lies prone on his back with his paws stretched upward, high in the northern sky, in a most undignified position; in the summer he is seen in the early evening skillfully balanced on the tip of his nose; in the autumn he descends gracefully to an upright position, which is the reason I have shown his star-picture to you at this time; in the winter he performs the acrobatic feat of balancing on the tip of his tail, so you will acknowledge that he is a star performer.

I shall give you on the diagrams of the star-pictures the old star names that have come down to us. Many of these names are long and difficult to pronounce, but some of them are very beautiful, and it will give you pleasure to memorize those that strike your fancy in order that you may call the stars by their names, which is always a pleasant thing to do when you recall how old the names are, and that people of bygone ages have worshipped the stars and built temples to them.

You will also find a number of strange letters on

the star-pictures that have been drawn for you. These are the Greek letter names of the stars given them by astronomers, and you can use them if you care to learn the Greek alphabet which you will find in the appendix.

Now that you have seen and know this wonderful star-picture of the Bear let me tell you some of the stories that men of old time told concerning the Bear in order that, whenever you look at these seven famous stars, it may give you greater pleasure than just the sight of the stars affords you. Just as a movie, interesting for the pictures alone, is made doubly interesting by the story that explains the pictures.

There are many stories about the Bear in the sky because this star-picture attracted the attention of people of all the northern countries of the world, and just as one person sees a face in a cloud, another an animal, so the people of one land had one story about the Bear while those of another country imagined something about him that was entirely different.

I will not try to tell you all the stories about the star-pictures that have come down to us, as it will be easier for you to remember a few of the better known ones. If you are interested you can read the books that have been written on the subject which contain many strange and fascinating tales about the stars.

According to a very old story the Bear in the sky is the figure of Callisto, a nymph, the beautiful daughter of Lycaon, the King of Arcadia. It is said that in the olden days there were powerful persons

called "gods" who ruled the earth and had the power of turning people into animals, or animals into people, if they took a fancy to do so. It seems that Jupiter, who was all-powerful among the gods, was very fond of Callisto. Because of this fact his wife Juno did not like Callisto any too well, and would quite likely have harmed her in some way if Jupiter had not protected her. He did this by changing Callisto into a Bear, and then for fear that the hunters or their dogs would harm her he placed her up in the sky, away from all danger, where she could be admired by everyone for all time, and so we see in this star-picture of the Bear the figure of the beautiful maiden.

Callisto had a little son named Arcas who was out hunting one day, before his mother who had been changed into a bear had been placed in the sky, and Arcas, seeing the bear, was about to kill his own mother. To save him from this terrible deed, Jupiter quickly changed him into a little bear, and placed the two bears close together in the sky. The poet Ovid gives us the following account of Callisto and Arcas:

He writes that Jupiter—

> snatched them through the air
> In whirlwinds up to heaven and fix'd them there;
> Where the new constellations nightly rise,
> And add a lustre to the northern skies.

We are told, you see, that Jupiter snatched the bears through the air and threw them up into the sky. It

seems quite likely that in order to do this he grasped them by the tails as he whirled them about to cast upward, and you will agree with me that if he did this, it might well account for the long tails of the unhappy bears that now appear in the sky.

According to another story, in the olden times it was thought that the sky was made of glass, and this glass sky touched the earth on all sides. It was a different sort of glass from the sort we have nowadays, for the story says it was soft and thin so that you could drive a nail through it without breaking it. Once upon a time, someone nailed a bearskin to the glass sky, using seven nails, and later the nail heads became stars, and now they shine for us every night to show us where the Bearskin hangs in the sky. The tail of the Bear is represented by three bright stars, as you see in the picture, and these are called the "handle of the Great Dipper."

Many interesting stories about the Bear are related by the Indians of this country which you will be especially glad to know because they were "made in America."

An Iroquois Indian story is as follows:—A party of hunters were once chasing a bear, but before they were close enough to kill him they met three monster stone giants. The giants were very angry at the hunters and tried to kill them, and being very strong they succeeded in killing all but three of the Indians. Suddenly, these three hunters and the bear were carried up to the sky by invisible hands, and now form the star-picture of the Bear. The three stars

Astronomy and Geography

From a mural painting by Will H. Low, in the New York State Education Building, Albany.

in the tail of the Bear are the three hunters, and they are seeking the Bear in the sky. The first hunter carries a bow, the second a kettle to cook him in when they have killed him, and the kettle is represented by the little star Alcor which, if your eyes are sharp, you will see close to the star called "Mizar." If you are unable to see it with the naked eye an opera glass presents a beautiful view of the star with its bright companion. The third hunter carries sticks with which to light a fire when the bear has been killed. In the autumn the first hunter hits the bear, and the blood-stains from the wounded bear colors the autumn foliage red.

The Zuni Indians thought that, when winter comes the Bear goes into his den where it is snug and warm and there he sleeps, instead of guarding the westland from the cold of the ice-gods who breathe out the chilling frost upon the land. In the spring the Bear awakens hungry and goes forth from his den in search of food, and his growling is heard in the thunder that mutters when the spring breaks the chains of cold that the ice-gods have wrapped about the world.

An interesting Basque story about the Bear in the sky is as follows:—A farmer once had two of his oxen stolen by two thieves. He sent his servant after them, and when, after a time, his servant did not return, he sent his housekeeper and dog to catch the thieves. After waiting a long time he lost his temper, which is always a bad thing to do, and decided to go after the thieves himself. Because he lost his

temper with his servants, who were doing the best they could to catch the thieves, he was taken up to the sky together with his oxen, the thieves, his servants, and even the little dog, and there we see them all in this star-picture. The first two stars in the Dipper are the oxen, then follow the two thieves represented by the other two Dipper stars, after these we see in the remaining three stars in the figure one after the other, the servant, the housekeeper, last of all the farmer, and even the dog is included and represented by the star Alcor.

The Arabs used to call the stars Mizar and Alcor, the "Horse and the Rider," and with them this pair of stars was a test of good eyesight.

The Basque people also thought this star-picture looked like a farmer's wagon, and they say that at one time a farmer was driving along near the shore of the Lake of Galilee and met our Saviour on the road. He had a good heart and offered our Lord a ride. For showing this kindness he was rewarded by a place in heaven, together with his wagon, and we see them both in this wonderful star-picture. The star Mizar represents the wagon and Alcor is the kind farmer.

Whenever we look at the stars Mizar and Alcor we will always bear in mind what they represented in the old stories, the Indian and kettle, the housekeeper and dog, the horse and rider, the wagon and farmer, and remembering these stories will always make the sight of these stars a pleasure to us.

In England, the seven bright stars that form the Dipper, are known as the "Plough" or "Wain," for

to many this star-picture looks like a plough, or wain which is another name for wagon. Those who think it resembles a wain, regard the three stars in the handle of the Dipper as three horses, hitched tandem, that draw the wain.

There are two stars in the Dipper that I want to call your attention to especially, for there is a fact concerning them that is very important for everyone to know. These stars are the first two in the Dipper, their names are Dubhe and Merak, or Alpha and Beta, but best known as "the Pointers." You will see, if you turn back to the sketch of the star-picture drawn for you, that, if you start at the star Merak and draw a line through the star Dubhe and a little ways farther, that you come to an arrow underneath which you will see the word "Polaris." This means that if you follow this line with your eye, about the same distance in the sky that the star Dubhe is from Benetnasch, which is the name of the star in the tip of the Bear's tail, you will see a star as bright as Dubhe. This star is called "Polaris," the "North Star," or the "Pole Star," and it is the most important star in all the sky. This is why you should know just where it is, and exactly how to find it. Remember this rule and you will always be able to locate Polaris whenever you can see the Dipper. If a line connecting the "Pointers" is extended onward in the sky a little over five times its own length it ends close to Polaris. If you will look at the sketch of the Dipper showing the positions in which we see it at different seasons of the year, you will see

the line drawn from the Pointer stars and that the arrows locate Polaris no matter what position the Dipper takes. This is such an easy rule to learn I feel sure that you will memorize it. The rule is never failing, and whenever it is a clear night you can always locate the north point in the sky. This, of course, gives you the other points of the compass, for if you face north the south point is back of you, the east point is at your right hand, the west at your left. Thus you have on clear nights a bright radio-compass of stars that is a useful possession.

URSA MINOR
THE LITTLE BEAR

Thuban
Once the Pole Star
Draco
The Guardians
of the Pole
3 Kochab 3
β
γ
URSA 4
MINOR
ζ
η
Camelopardalis
4
ε
4
δ
Yildun
Polaris 2
The Pole Star α
Cepheus
Draco

URSA MINOR

URSA MINOR (er'sa mi'nor)—THE LITTLE BEAR. (Face North.)

THE next star-picture that I will show you is a companion picture to the one of the Great Bear. It is called the "Little Bear" or the "Little Dipper." As in the picture of the Great Bear, you must look for seven stars, but most of them are faint, so that it is only on clear nights, when the moon is not in the sky, that we can see all of the seven stars.

The brightest star in the Little Bear is the star Polaris, or the North Star, which I have already pointed out to you, so you know just where to look in the sky for the first of the seven stars in this picture. In the early evenings in autumn, starting with Polaris, look to the left and you will see four stars about an equal distance apart in a line that curves slightly downward. The first three of these stars, counting from Polaris, are faint, but the fourth star, the one at the end of the line is almost as bright as Polaris and this star you will easily locate. The name of this star is "Kochab," and a little to the left of it you will see a star not quite as bright as Kochab. These two stars are called the "Guardians of the Pole" because they circle about it constantly, keeping, as it were, careful watch over this precious jewel in the sky.

The poet Lowell, writing of this star-picture in one of his poems, calls it:

The Bear that prowled all night about the fold of the North Star.

You will realize how watchful the "Guardians of the Pole" are when I tell you that at all times of the night, and at every season of the year, the guardians are always to be found between the Great Bear and Polaris, so that the Bear, in spite of the fact that he is close to the North Star, has no chance of ever harming it.

If you will look at the drawing of the star-picture you will see that I have connected the dots representing the stars with lines, thus outlining the figure of the Little Dipper. The faintest of the seven stars in the picture is the star marked "η"; this is the Greek letter eta, which is the name of this star. If the night is perfectly clear you can see this star, but you must not expect to see it if there is an electric arc light near you, for all artificial light is to be carefully avoided if you would see the sky pictures to best advantage, just as the movies are best seen on the screen when the theatre is darkened.

The operator of our movie machine causes all the stars in the Little Dipper to circle around Polaris, just as the boys and girls with joined hands circle about the one who stands in the centre when the game of "Ring around the Rosy" is played.

You have all seen a domestic animal tied to a stake

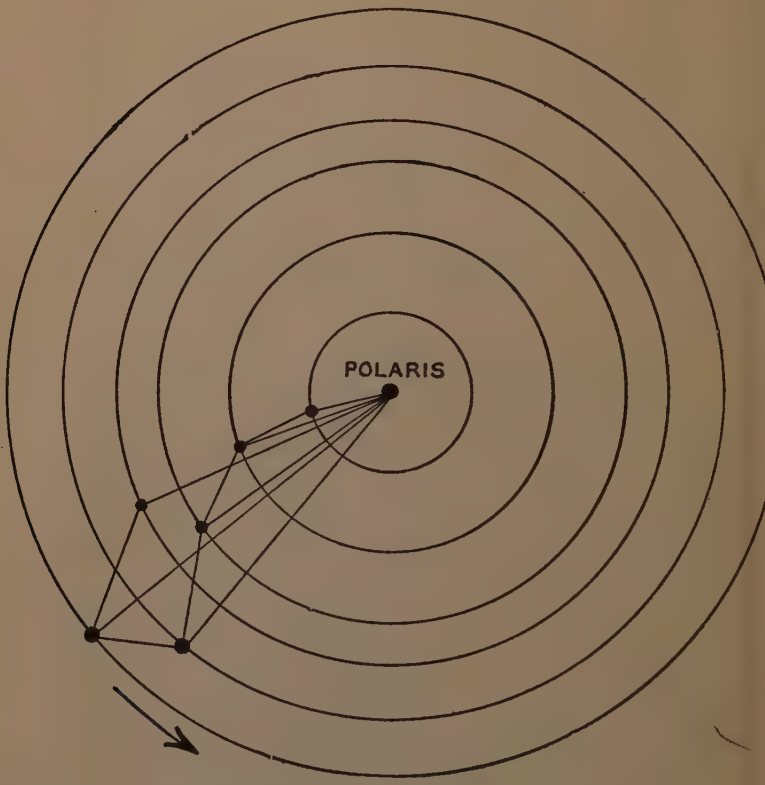
in a field. Imagine that each of the stars in the Little Bear are bound to Polaris with a cord; the length of the cord being the distance between each star and Polaris. The stars all move around Polaris at the cord's length, at the same time, just as the animal moves about the stake. The animal, however, can move nearer the stake if it wishes to, but each star must move at its own cord's length from Polaris. In the following sketch I show you each of the stars in the Little Bear connected to Polaris with a line. Through each star runs a circle which the star must follow as it turns about Polaris once in every twenty-four hours.

The stars circle opposite to the way that the hands of a clock move, and the Guardian of the Pole, now on watch at the left of Polaris, will, in a short time appear below that star and later on be seen to the right of it. To get this motion clearly in mind, place a sheet of thin paper over the drawing and trace the seven dots representing the stars in the Little Bear, then stick a pin through the dot which represents Polaris and turn the picture about contrary to the movement of the hands of a clock, and you will reproduce exactly the motion of the stars as they ceaselessly circle the Pole, making one complete revolution every twenty-four hours.

These circling stars make an excellent time-piece; in a short time if you study the position of the Guardians of the Pole closely you will be able to make a good guess as to what time of night it is.

Is it not wonderful that we should have here pro-

vided for our use for all time a reliable compass, time-piece, and I may add calendar, of service to us every clear night of our lives?



The daily path of the stars in the Little Bear.

You will see that the Little Bear follows in his turning the acrobatic example set by his mother, but performs his feats on his own hook so to speak,

being an independent sort of a bruin. While the Great Bear appears on all her four feet, looking her best, her cub is performing a somersault, and now seems to be balanced on the tip of his nose. In order that you may have his best picture before you I show him standing on all fours grubbing about for food, which I fear is difficult to find and very high in Starland.

A beautiful Indian story about the Little Bear is as follows:—Once upon a time a hunting party of Indians lost their way in the forest, and being in doubt which way to go, prayed to the gods to show them the way homeward. While they were praying, a little girl appeared to them and told them that she was the spirit of the Pole Star sent to be their guide. Following her they reached home safely, and ever thereafter they called the "Pole Star," the star which never moves! When the hunters died they were carried up into the sky and every clear night we can see them in the stars of the Little Bear following the Pole Star faithfully.

You will recall that, according to the old story, the Little Bear represents Arcas, the son of Callisto, who was saved from a cruel deed by Jupiter's kindly act.

> . . . the star on starry night
> The seaman singles from the sky,
> To steer his bark forever by.

This star which the poet Moore mentions, is Polaris, and the chief object of interest in this star-picture, the importance of which as a true guide has been

explained. Because of this fact Polaris was a star of the greatest service to mariners. This famous star, which has been called "the lovely northern light," is the star above all others which has proved of the greatest practical use to man, and is consequently best known and most celebrated of all the stars. As the poet Lucan expresses it:

> Of all yon multitude of golden stars,
> Which the wide rounding sphere incessant bears,
> The cautious mariner relies on none,
> But keeps him to the constant pole alone.

And the poet Dryden thus describes the reliance placed in Polaris as a guide to the early navigators:

> Rude as their ships were navigated then,
> No useful compass, no meridian known,
> Coasting they kept the land within their ken
> And knew no north but when the Pole star shone.

The fact that this star always pointed the way to the north was known at a very early date in history. As we find the first navigators of the far East relying on the sight of this star to show them their way across the uncharted seas, so, too, we discover that the importance of this star as a guide was known to the primitive inhabitants of Central America, and many other widely separated lands.

The Arab name for Polaris was "the Kid," and they imagined that it was the "hole in which the axle of the earth was borne"; their astronomers, however, called it "the star of the north."

Shakespeare, in his play of *Julius Cæsar*, thus alludes to Polaris:

> . . . constant as the northern star
> Of whose true fixed and resting quality
> There is no fellow in the firmament.

During the Civil War, escaping slaves and Northern prisoners were guided by the friendly beams of this star as they endeavored to make their way northward, and, likewise, in the late World War, a knowledge of Polaris was of great service to prisoners escaping from Germany.

Truly this star has been a beacon of hope, a faithful friend to all, and we should have the greatest admiration and respect for it. Learn to know Polaris well, and as often as you gaze on its cheering beams recall in gratitude the great service it has rendered and is ever conferring on all mankind.

The celebrated American poet William Cullen Bryant, has written a poem to Polaris, entitled "Hymn to the North Star," which is too long to quote here, but which you will enjoy reading now that you know this famous star. The concluding lines of this poem are as follows:

On thy unalterable blaze
The half-wrecked mariner, his compass lost,
Fixes his steady gaze,
And steers, undoubting, to the friendly coast.
And they who stray in perilous wastes by night
Are glad when thou dost shine to guide their footsteps right.

CASSIOPEIA
THE LADY IN THE CHAIR

Discovered by
Caroline Herschel
Schedar
Caph
Marfak
Ruchbah
1572
CASSIOPEIA
Cepheus

CASSIOPEIA

CASSIOPEIA (kas-i-ō-pe′-ya)—THE LADY IN THE CHAIR. (Face North.)

We will now look for the sky-picture of the famous Queen Cassiopeia, who appears seated in her chair or throne of stars.

The picture is an easy one to find, and contains five stars that are fairly bright. You must face north to see this picture, as you did when you were out hunting for the Bears. The star Polaris is to be found always halfway between the Great Bear and the star-picture of Cassiopeia. If you draw a line from the star Mizar in the Great Bear to Polaris and extend it up the sky the same distance, the end of the line will be close to the star-picture of Cassiopeia. You have in the two pointer stars, Mizar and Polaris, unfailing guides to enable you to find Cassiopeia in whatever position it may happen to be.

Look at the large picture of the night sky in autumn, holding the book upside down to get the correct view of the sky as you face north, and you will see Cassiopeia on the opposite side of Polaris from the Great Bear.

What will strike your attention at once in this star-picture is a zigzag row of five stars of almost equal brightness, that forms a queer shaped letter "M" which looks as if it had been pulled out of shape.

It is hard to understand how anyone could have seen in this row of stars a lady seated in a chair. The picture as we see it does look something like a broken-backed chair, but for the graceful figure of Queen Cassiopeia we must look at the picture that has been drawn of her.

In the summer-time when this star-picture is below Polaris the letter "M" is turned upside down and looks like a letter "W."

Just to the left of the star marked "κ" or "Kappa" as it is called, you will see on the diagram a little square and the date 1572. This marks the spot where a bright new star appeared in this year which was first seen by a noted Danish astronomer by the name of Tycho Brahé, and this new star is known to us as "Tycho's Star." It was so bright when it was first discovered as to be visible in full sunshine. For some time after its appearance this bright star was called the "Stranger," or the "Pilgrim Star," and the "Star in the Chayre." The star gradually faded from view and by March, 1574, had entirely disappeared.

It may seem strange to you that new stars appear in the sky, but the appearance of "Novæ," as new stars are called, is not an unusual occurrence, though few have appeared that are as bright as Tycho's Star. Astronomers cannot account for these new stars, but they are working on the problem and some day we may know the reason for their appearance.

In the meantime those who know their geography of the sky well, and look at the star-pictures often,

have the best chance of detecting a new star, which is a wonderful discovery. Whenever you are out at night always look up at the stars, and if you know the pictures well you will see at once if there is a bright new star in any one of them. If you should be so fortunate as to find a new star it is your duty to telephone the fact to the nearest Observatory where those in charge will be greatly interested in your discovery.

We will now look at the stars in this picture. The one called "Caph" was named by the Arabs, and it means "the Hand" which was one of the Arab names for this star-picture.

The star marked "γ" which astronomers called "gamma" was known to the Chinese as a "Whip."

Ruchbah is an Arab star name meaning "the Knee," and the star Marfak was called by them "the Elbow," both of these stars occupying their proper places in the picture.

While you have been looking at this picture of the Lady in the Chair, you have no doubt noticed the strange milky or cloud-like appearance of the sky that is all about the stars in the picture. It is something quite unlike anything you saw when you were looking at the pictures of the Bears. This is the famous "Milky Way" that extends across the sky like a broad band, and Cassiopeia seems to be in the midst of it. The cloudy appearance is due to the fact that the Milky Way is composed of a great multitude of faint stars which the telescope reveals. It is as if the stars were swarming as perhaps you have

seen bees or insects do in their flight from place to place.

On a clear night you can trace the Milky Way for a long distance and you will see that it is broken up in many places, and has the appearance of a "piece of ribbon which has been snipped by scissors in pure mischief, or it may be compared to a river broken up into many channels by rocks and obstacles in its course." In a later chapter you will find some of the interesting stories that have come down to us about this wonderful band of stars that seem to bind the sky with a golden girdle.

The star-picture known to us as Cassiopeia is exceedingly old. It is said to date back as far as 3500 years before the birth of our Saviour. According to the old stories Cassiopeia, was the beautiful wife of Cepheus, King of Ethiopia, and the mother of Andromeda. Cepheus and Andromeda both appear in the sky-picture and I will point them out to you later.

The beautiful Cassiopeia does not appear to have been very wise, for a knowledge of her beauty made her vain and conceited, so much so, that she openly boasted that she was more beautiful than the sea nymphs, which was saying a great deal.

The sea nymphs were very angry with Cassiopeia when they learned of her foolish boasting, and informed the god Neptune, who ruled the sea, of the insult to them. Neptune considered their case a good one, and to punish Cassiopeia for her vanity sent a sea monster to prey upon the coast of Ethiopia.

Later, he felt that this was not punishment enough, and accordingly he forced Cassiopeia to chain her dearly loved daughter to a rock on the seashore where she was exposed to the danger of being killed or carried away by the cruel sea monster. The sequel of this tragic story will be told you in the stories about the star-pictures of Cetus, Perseus, and Andromeda.

In order that an everlasting example might be made of Cassiopeia, to ever remind mankind of the folly of conceit, she was placed by the gods among the stars in such a way that she would be forever compelled to circle about Polaris in the northern sky. Although she has a chair to hold on to she often appears in the sky upside down which is undignified in a Queen and an unpleasant position, to say the least. As the poet Aratos writes:

> She head foremost like a tumbler sits.

Cassiopeia is sometimes called "Heaven troubled Queen," and "Unhappy Cassiopeia," which are good names for her considering the punishment inflicted on her.

The poet Milton thus refers to Cassiopeia:

> . . . that starred Ethiop's queen that strove
> To set her beauty's praise above
> The sea nymphs and their power offended.

Cassiopeia is a good example of the variety of pictures that the people of many lands imagined in the

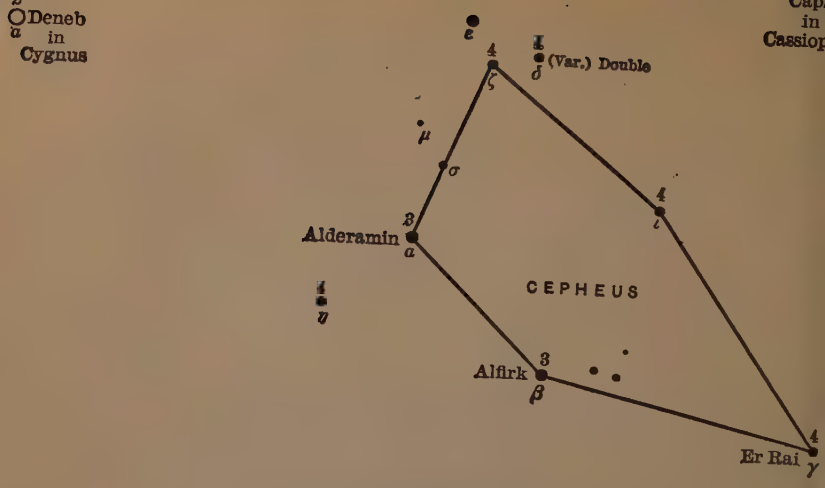
same star-picture. We have been told that the Arabs fancied they saw a Hand in these stars. They also called this star-picture "the kneeling camel." The Egyptians called it "the Leg," the Eskimos a "stone lamp," and the Greeks a "Key."

The poet Aratos thus alludes to this name for our sky-picture:

> Not many are the stars nor thickly set
> That, ranged in line mark her whole body out,
> But like a key that forces back the bolts
> Which kept the double door secured within
> So shaped her stars you singly trace along.

Queen Cassiopeia belongs to the so-called "Royal Family" of Starland and plays an important part in the well known story of Perseus and Andromeda which will be told you when you know these star-pictures.

CEPHEUS
THE KING



Polaris

CEPHEUS

CEPHEUS (sé-fūs)—THE KING. (Face North.)

Cepheus illumes
The neighboring heavens; still faithful to his queen.

Not all the star-pictures are as bright or as easily found as the three you now know. The one I will next show you is rather faint and difficult to find and for this reason it is not known to many people. It is useless to look for it except on a clear night when the moon is not in the sky.

The name of this star-picture is Cepheus, the King. This is the way to find it: Let the pointer stars of the Great Bear guide you to Polaris, and then extend this imaginary line up the sky for a distance a little more than the distance separating the stars Dubhe and Megrez in the Great Bear, and you will see a faint star about as bright as the star Marfak in Cassiopeia. This is the star Er Rai in the star-picture of Cepheus.

Another way to find this picture is to draw a line from Schedar to Caph in Cassiopeia, and extend it onward about twice its length. If you do not find Cepheus readily look carefully at the large plate showing all the stars, holding the book upside down. Look also at the diagram which shows you Cepheus

with the stars Caph and Polaris above and below it respectively.

This star-picture, like Cassiopeia, contains only five stars of importance. In Cepheus the stars in the diagram are connected with lines, and the figure looks not unlike the rough outlined sketch of the front view of a house with a very steep roof. I think you will have no difficulty in finding the picture if you study the maps closely and follow the directions I have given you.

When you have found the picture you will see that a line drawn from Alderamin through the star Alfirk points to Polaris. This will prove to you that you have found the picture of the King in the sky.

A little above the star Alderamin, and just to the left of the line drawn on the diagram upward from this star, you will see a small dot representing a faint star marked "μ," called by astronomers "Mu Cephei." I want you to find this star in the sky and look at it with an opera glass, for it is a very beautiful object. Because of its color, which is garnet, it is often called the "Garnet Star," and it is the reddest naked eye star in the sky; for this reason it is well worth seeing. To see the color of the star to advantage, compare its light with that of the star Alderamin when the garnet color of Mu will be at once noticeable.

The brightest star in this picture is Alderamin, which "beaming bright is on the shoulder placed." To the Arabs this star name meant the "right arm."

The Arabs called the star Alfirk "a flock," and the

star Er Rai "the shepherd." One of the fainter stars in the picture they knew as "the dog," and other stars near-by were known to them as more members of the flock of sheep. You see how natural it was for the shepherds to see in certain stars a likeness to the scenes they were familiar with in their daily lives. If we had the naming of the star-pictures to-day in all probability we would give them such names as "the Automobile," "Aeroplane," "Locomotive," all familiar objects in the life of the times.

The star marked "δ," known to astronomers as "Delta Cephei," is an interesting star and worthy of our attention. If we had a small telescope we would see that instead of the one star we see by the naked eye, it is really a double star. Two beautiful stars are visible in the glass, the larger one of a deep yellow color, the smaller of a slightly bluish tinge.

Few people know that there are such wonderful and beautiful objects in the sky as double stars, but the telescope reveals thousands of them, and many of them are exceedingly attractive objects to observe because of the contrasted colors of the twin stars.

Delta Cephei is an interesting star for another reason:—It is a Variable star, and this means that its light is not always the same. Most people think that the light of the stars never changes, but such is not the case, and some stars that are visible to the naked eye gradually become so faint that they cannot be seen even in small telescopes.

Astronomers can account for the change of light in

some of the Variable stars, but they do not know why the light of Delta Cephei varies. At its brightest it is about equal in brilliance to the star marked "ι," which astronomers call "Iota Cephei." During the course of five days and eight hours its light gradually diminishes a little over a magnitude, or two and one half times, and then brightens up to its original brightness. Anyone can follow with the naked eye the remarkable and interesting changes of light in this star, and it is well worth while to do so, for we have here presented to our view a wonderful problem that all our knowledge does not enable us to solve.

The star-picture of Cepheus the King representing as it does, the figure of the father of the Royal Family of Starland, was held in high esteem in very early times in the world's history. We find the King's story in the literature of Greece as far back as the fifth century before the birth of Christ, and it is said that the star-picture of Cepheus was known to the Chaldeans 4200 years ago.

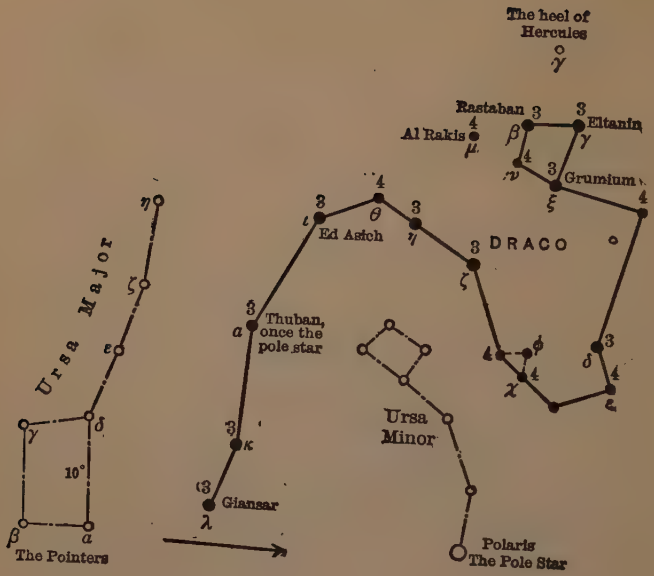
Cepheus was the King of Ethiopia, and, as we have seen, was the husband of the beautiful but unfortunate Cassiopeia, who is placed near him in the sky. Cepheus plays only a small part in the story of the sacrifice of his charming daughter Andromeda, which will be told later. Perhaps this is why this star-picture is such a faint one.

The King is shown in the picture as seated on his throne in regal state, holding his sceptre upraised in his left hand, and holding his robes with his right. It is claimed that Cepheus was one of the famous band

known as "the Argonauts," who went with Jason on his dangerous expedition in quest of the golden fleece. Because of the part he took in this journey Cepheus was given an honorable position in the sky, even if his stars are not as bright as those in other pictures.

The Chinese, who are a very old people, and who studied the stars attentively, also considered this star-picture a royal one for they placed here the Inner Throne of the Five Emperors; but the Arabs, as we have seen, pictured in this place a simple every-day sort of a picture, a shepherd and his dog guarding a flock of sheep. Goats, calves, and camels were also a part of this pastoral scene in the sky.

DRACO
THE DRAGON


The heel of Hercules
γ
1
Vega in Lyra
Rastaban
Al Rakis
μ
β
γ
Eltanin
ν
Grumium
ξ
Ed Asich
ι
θ
η
DRACO
ζ
Thuban, once the pole star
α
κ
Giansar
λ
Ursa Major
ζ
ε
γ
δ
10°
β
α
The Pointers
Ursa Minor
Polaris
The Pole Star
Os
Cepheus

DRACO

DRACO (drā′-ko)—THE DRAGON. (Face North.)

You now know four of the five circumpolar star-pictures, those that continually circle Polaris, and which you can see at any time of the year. It only remains to show you the picture of Draco, the Dragon, to complete your knowledge of the stars of the northern sky.

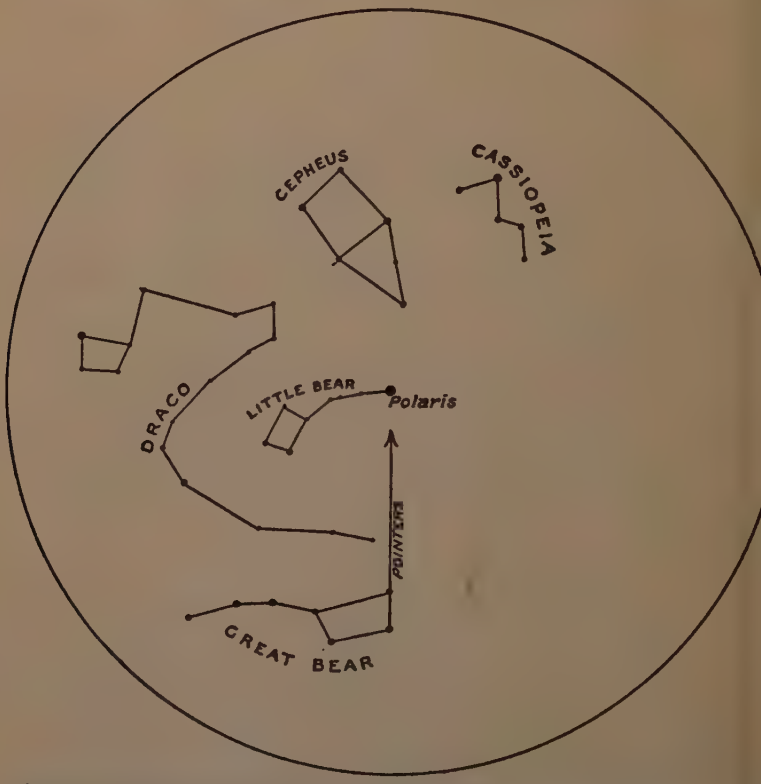
Please look at the special map of the circumpolar star-pictures. You will at once note the positions of the four pictures that you know, and you will see that Draco is well named "the Dragon" for it is a long-drawn-out picture and coils about between the Bears.

> Here the vast Dragon twines
> Between the Bears and like a river winds.

The Bears seem to keep guard over the Dragon and prevent it from harming the royal pair, King Cepheus and Queen Cassiopeia. The tip of the Dragon's tail is marked by the star "Giansar." You will see this star just off the line that directs you from the pointer stars in the Great Bear to Polaris, a little way from Dubhe.

Start with the star Giansar, and look to the left

about midway between the Bears and follow a row of four faint stars; then look up the sky, swinging to the right toward Cepheus you will see three more.



The circumpolar star-pictures as they appear in the early evening in n autumn to an observer facing north.

A little farther up the sky note a small triangle of stars with a star at the right and above it; at this point turn your eyes to the left, and look for two

stars. Then a short distance farther on to the left is a fourth magnitude star; drop down a little ways from this star to the head of the Dragon marked by a small four-sided figure outlined on the map.

Briefly stated, the directions are as follows: Starting with the star Giansar, you trace the stars to the left till you clear the tail of the Great Bear, then look up the sky swinging to the right till you are about in a line with the star Er Rai in Cepheus. Look to the left a little way and you will see the figure that marks the head of the Dragon.

It is hard to follow closely the directions for finding the star-pictures, and the best plan is to flash your light for a second at the map and then look up in the sky. In order that the light may not dazzle you, it is a good plan to place a piece of thin red tissue paper over the flash light which is easily held in place by a rubber band. If you will memorize the positions of the star-pictures shown on the map I think you will have little difficulty in finding the Dragon.

The head of the Dragon is about the same distance from the Little Bear as the Little Bear is from the tail of the Great Bear. When you think you have found Draco see if this statement is true; if so, you have succeeded in your quest.

There are several stars of interest in this star-picture. The star Thuban was the Pole Star or the Polaris of the sky about the year 2790 B.C. It is a little difficult to understand why this is so, and an explanation is out of place in a guide book to the

stars. You will find the subject fully explained in any good book on astronomy.

Owing to its prominent position in the sky, Thuban was formerly a star of great importance, and it has borne these high-sounding and illustrious names: "Judge of Heaven," "High Horned One," "Proclaimer of Light," "High One of the Enclosure of Life," "The Favorable Judge," "Life of Heaven," "The Prosperous Judge," and "Crown of Heaven," so we have quite a number of names to choose from.

Four thousand years ago the light from Thuban could be seen both by day and night from the bottom of the central passage of the Great Pyramid of Cheops, at Ghizeh, in Egypt. It is thought that in the olden times Thuban was a much brighter star than it is to-day.

What an extremely interesting fact this is! Whenever you look at this star, think of what it meant to the Egyptians who worshipped this star as we do God, thousands of years ago, and what a reverence they must have had for its silver light which streamed down that dark and narrow passageway, three hundred and eighty feet long, till it touched and illuminated the altar in the inner recesses of the wonderful pyramid. Surely the stars are worth knowing when they can bring to mind such interesting thoughts as these.

The brightest star in this picture is "Eltanin," known to the Arabs as the "Dragon's head." It is orange in color, and a star of importance and interest in all ages.

In Egypt, where the stars were worshipped and wonderful temples were built in their honor it was the custom to build the temples in such a way that the light of a star, when it rose over the eastern hills, would shine directly down a long passage constructed for this purpose. Just as if you were to stand in a long dark railway tunnel that ran east and west, at one time of the year you would see the sun rise directly before you if you faced east, and the tunnel would straightway be brilliantly lit by the sunshine for a few moments.

The Egyptians built many beautiful temples on this plan with passageways directed to the rising point of certain bright stars. A knowledge of these facts makes these stars especially interesting to us.

Eltanin was known to the Egyptians as "Isis," and 3500 B.C. they built, among others, the celebrated temple of Hathor at Denderah, dedicated to the worship of this star. Another temple built to this star was built at Thebes, and it is of interest to know that in 1130 B.C. a temple to Isis was built in the Greek city of Thebes, which was the capital of Bœotia and known as the "City of the Dragon." Thus we see that the worship of this star spread from Egypt to Greece, and we even find it worshipped in Italy at an early date in the temple of Isis at Pompeii.

Eltanin is also an object of particular interest to astronomers as observations of it by Dr. Hooke led Dr. Bradley to discover the laws of the aberration of light, which is a matter too deep for us to explain here. This was a very important fact to establish,

and this star will always be a memorial set up on high in honor of Dr. Bradley's discovery.

The old stories that have come down to us relating to the Dragon are somewhat confusing. By some, this is the monster serpent that guarded the golden apples in the wonderful garden of Hesperides. One of the tasks that the mighty Hercules had to perform was the picking of this well-guarded fruit, and he had a desperate encounter with the Dragon which he finally succeeded in killing, and made off with the golden fruit.

Draco was also said to be the dragon slain by Cadmus, the hero of Thrace. In this case the Dragon was said to guard some sacred water which Cadmus was ordered to procure. With the assistance of Minerva, Cadmus conquered in his fight with the Dragon which he slew, and plucked out its teeth. These he sowed in a field when immediately a great number of armed men appeared.

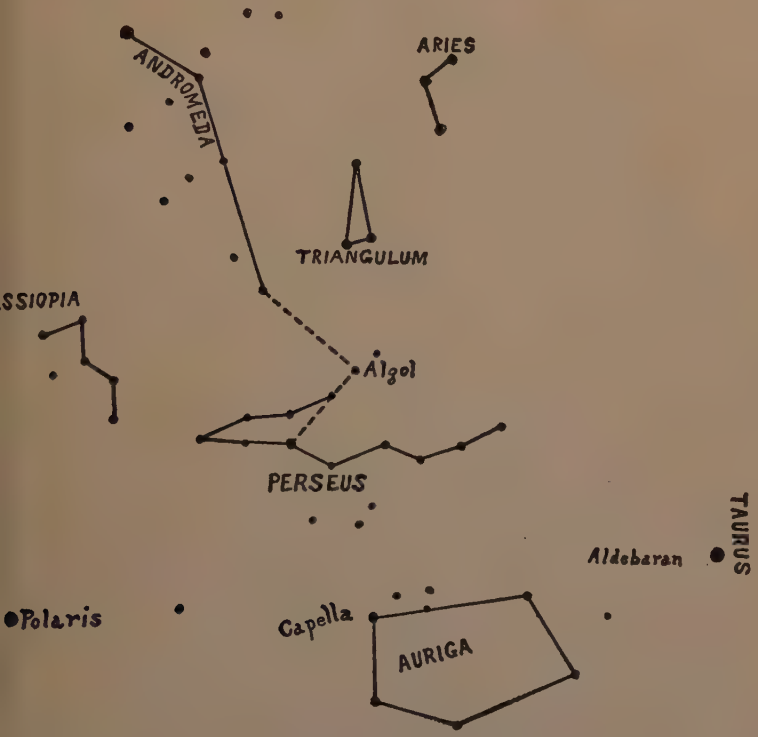
> O'er all the field the breathing harvest swarms
> A growing host; a crop of men and arms.

Cadmus feared for his safety, but the men attacked each other and there was a battle royal. Only five men survived this bloody conflict, and these helped Cadmus to build the city of Bœotia which since that time was called the "City of the Dragon."

Another story is as follows: In the war with the giants, the goddess Minerva seized the Dragon and hurled it into the northern sky, where it became entangled in the axis of the heavens, and there we behold it sleeping to this day, coiled about the Pole.

1811

In all these stories you see that the Dragon was slain in a fight, and its dead form was placed in the sky. The Evil One in the Garden of Eden is represented as taking the form of a serpent, and perhaps these stories symbolize the triumph of man over the powers of evil. This idea is carried out further in some of the star-pictures which appear in the summer months, and which I will point out to you later.



The eastern and northeastern night sky in mid-autumn.

AURIGA
THE CHARIOTEER

Castor
Gemini
Herschel's Telescope
Menkalinan
2
β
3
θ
AURIGA
Capella
(Creamy white)
1
a
The
37 M.
The Kids
37
ε
4
ζ
4
7
4
5
β
Tauri
2
Nath
38 M.
3
ι

AURIGA

AURIGA (aw-ry′-ga)—THE CHARIOTEER.
(Face Northeast.)

No doubt while you have been looking at the stars in the northern sky, your attention has been attracted to a bright and beautiful star in the northeast. This is the star Capella in the star-picture of the Charioteer. It is the brightest star in the northeastern sky in the early evening in mid-autumn, and the nearest bright star to Polaris, and is one of the most beautiful in all the heavens.

A line drawn from the head of Draco through Polaris, extended a little over its length, ends close to Capella, as does a line drawn from Phad, in the Great Bear, through the Bear's head and prolonged a little over its length. A glance at the map of the stars in this region of the sky at this time of the year shows the position of Auriga.

This star-picture contains five stars, besides Capella, that are fairly bright, and when lines are drawn connecting these stars you have a clearly defined five-sided figure which is very easy to find and unmistakable.

Capella is so situated in the sky that, as it circles Polaris, it can be seen at some time of the night every month in the year. For this reason it is especially worth knowing. In October it rises at sunset almost

exactly in the northeast, so that if a cloud covered Polaris that did not extend to Capella, you could get your compass bearings from this star.

The following facts regarding Capella, that Tennyson called "a glorious crown," are of interest in passing, even if this book is intended to be a simple guide to the stars:

> And scarce a star with equal radiance beams
> Upon the earth.

Capella is a pale yellow star, similar in age and color to our sun which is also a star, a fact that is not generally known. It is much larger than our sun and gives out at least one hundred and twenty times more light. Its light takes nearly forty-nine years to reach us, so distant is this giant sun from us. It has been found that light travels at the rate of 186,000 miles a second. This is almost unthinkably fast, and it is wonderful that we have been able to measure a rate of speed as rapid as this.

Capella has a companion that circles about it in a little more than a hundred days, but so close to it as to be invisible even in our largest telescope. You will wonder how we know this is so if we cannot see the companion. An instrument called the spectroscope, which is one of the most wonderful ever invented, reveals the fact, and what is more, it tells us what the stars are made of, and how fast they are moving toward or away from us. The spectroscope has revealed that many of the stars have close com-

panions that we do not see because of their great distance from us.

Capella is traveling away from us at the rate of about twenty miles a second, and to-night it is more than a million miles farther away from us than it was last night. We would naturally suppose that at this great speed away from the earth that it would be only a short time before it was lost sight of, but space is so great that it takes hundreds of years to notice a change of this sort.

The star name Capella means literally "the little shegoat," and the star is frequently called "the Goat Star." Because of its beauty and brilliance it is a star famous in the history of all ages.

The Arabs called it "the Driver," "the Singer," and "the Guardian of the Pleiades," the famous little star cluster in the picture of Taurus that I will tell you of later.

According to an old story, the god Jupiter in playing with the Goat broke off one of her horns. To make amends for this misfortune he ordered that the possessor of the broken horn should have it filled with whatever he wished, and it was called "the Cornucopia" or "Horn of Plenty." You see these at Christmas time filled with candy adorning the Christmas tree. Whenever you see one now you will be reminded of the star Capella.

The ancient Peruvians of South America called Capella "Colca," and it was a favorite star with their shepherds as it was with the shepherds of far eastern lands. In India, Capella was a sacred star, and

known as "the Heart of Brahma," and in Egypt many temples were dedicated to its worship.

In spite of the beauty of Capella it was not a favorite star with the mariners of olden times. They called it "the Rainy Goat Star," and "the Kids." The poet Aratus wrote:

> Capella's course admiring landsmen trace
> But sailor's hate her inconspicuous face.

Callimachus, a poet of the third century wrote in like vein:

> Tempt not the winds, forewarned of dangers nigh,
> When the Kids glitter in the western sky.

There is much more to be told concernng this celebrated star, but we must pass on to the other stars in the picture.

Close to Capella you will see three faint stars that form a small triangle. If you are not quite sure that you have found Capella look for this little triangle, and if you see it close by a bright star you may be sure the star is Capella. These three stars represent the kids that the Goatherd carries in his lap, while on his shoulder you see the goat represented by the star Capella.

The star "Menkalinan," which is receding from us rapidly, has a close companion invisible in the telescope but revealed by the wonderful spectroscope. Below it, look with an opera glass for the fine star cluster marked 37 M. It is surprising what

Photo by Anderson

The Forge of Vulcan

even an opera glass will reveal of the beauties of Starland. When you go out at night to look for the star-pictures always take such a glass with you and you will be amply repaid with the wonderful sights it reveals.

The star "Nath" is a star common to two star-pictures, Auriga and Taurus, the Bull, the red eye of which, represented by the ruddy star Aldebaran, you may see rising now low in the east.

The star-picture of the Charioteer is extremely old. According to the ancient Greek story the figure represents Erichthonius, the son of Vulcan and Minerva. He was deformed, it is said, and so could not get around very well. This fact led him to invent the four-horse chariot, which no doubt was as great a curiosity in its time as the first automobile that appeared in our day. This invention secured for Erichthonius, who became fourth King of Athens, a place in the sky, but why he is adorned with a goat and her kids we do not know.

> His art great Jove admir'd, when first he drove
> His rattling carr, and fix't the youth above.

Another name for this picture is the "Reinholder," and we see in the figure the ends of the reins held in the driver's right hand.

According to another story, Auriga was the son of Mercury, and the Charioteer of Œnomaus the King of Pisa. He was reputed to be most skillful in the training of horses, and those trained by him were the swiftest steeds in Greece.

To account for the presence of the Goats and Kids we have this story:

Almathea, the daughter of the King of Crete, had the honor of feeding the god Jupiter with goat's milk. It is said that for this deed Jupiter rewarded her with a place in the sky where she figures as the goat. He gave one of her horns to the nymphs who had taken care of him in his infancy, and this horn was the horn of plenty that furnished its possessor with every wish.

PERSEUS
THE CHAMPION

γ
Andromeda
The Segment of Perseus
34 M.
Algenib
Algol in the
Head of Medusa
a famous variable
PERSEUS
Menkib
Atik
Capella
The Kids
Auriga
The Pleia
in Taur

PERSEUS

PERSEUS (per′-sūs)—THE CHAMPION. (Face Northeast.)

Perseus next
Brandishes high in heaven his sword of flame.

A GLANCE at the map of the northeastern sky at this time, will show you where to look for the star-picture of Perseus, the Champion, which next claims our attention.

The brightest star in this picture is Algenib, which is on the imaginary line drawn from Schedar in Cassiopeia to the star marked "ι" (Iota) in Auriga, and is about midway between the two.

Algenib has two companions, stars of about equal brilliance, on either side of it. The three stars are in a curved line resembling a bow which is called "the Segment of Perseus," and serves to identify the picture. Perseus is perhaps best placed for observing in the early evening, about October 1st, when it is rising in the northeastern sky.

This picture lies in the Milky Way in a rich setting of twinkling stars. The region about Algenib is exceedingly beautiful when viewed in an opera glass.

The star Algenib, meaning "the Side," is also called "Marfak," an Arab name signifying "the

Elbow." It is lilac in color, and is about equal in brightness to Polaris. In the latitude of New York City it never sets. It is approaching us at the rate of six and one-half miles a second, but as it is forty-four light-years distant it will be many centuries before any increase in its brightness is noticed here.

Perseus contains one of the most interesting stars in the sky, the noted variable star Algol, the position of which is clearly shown in the diagram. Its light variations are most striking and should be observed by everyone as one of the remarkable sights Nature presents to our view.

It is said that Lalande, a famous French astronomer, used to remain whole nights, in his old age, on one of the bridges of Paris to show those who passed by the wonderful sight that the changes in the light of Algol present.

For two and one-half days the light of Algol, which is about the same as that of Polaris and Algenib, does not change, then it begins to grow gradually dim, and in the course of nine hours is only as bright as a 3.5 magnitude star, which is a little brighter than the star "η" Eta Persei, the second star above Algenib in the diagram. Algol remains dim for only twenty minutes and during the next four hours regains all its lost light.

The best time to see this wonderful sight is in the early evening in the autumn. Compare the light of Algol with that of the stars Algenib and Eta. If it is as bright as the former star you will know that it is constant for the time being. If it is fainter you

will know that a change is taking place, the nature of which will be revealed in a short time. If you see it as faint as Eta, watch it closely and you will see it brighten rapidly.

The variations in this star were first noted by Montanari, in 1672. Goodricke in 1782 by frequent observations, was able to determine closely the time it took to complete one variation and explained the light changes as due to the revolution about Algol of a companion star. This discovery has been confirmed, and what is more, and most wonderful to think of, we know the size of this invisible sun that circles about Algol, and its distance from Algol.

You can illustrate the cause of the variation in the light of Algol in this way in your sitting-room some night: Let someone hold a lighted lamp or candle in his upraised hand, while a second person circles about him. If you will gaze steadily at the light you will see it disappear when the person circling about comes between you and the light. In the case of Algol the eclipse is not total, so the person holding the light should raise it a trifle, in order that the person walking around the light-bearer does not wholly cut off the light from you.

At nine o'clock on the evening of December 23d, Algol is almost directly overhead for those living in New York City. This star is approaching us with a speed of two miles a second, but it is so far away that we cannot measure its distance.

The astrologers of old considered Algol the most unfortunate star in the sky. It represents the cele-

brated Medusa's Head which the Champion holds in his outstretched hand. Algol has been called "Satan's Head," "the Spectre's Head," and "Double Eye."

A little beyond the star Eta, in the direction of Cassopeia, is the point in the sky from which the shooting stars, or meteors as they are properly called, seem to dart from. This shower is best observed about August 10th. If you are out looking at the northeastern sky at this time you may see these swiftly darting meteors. They are known as "the Tears of St. Laurence."

About midway between Perseus and Cassiopeia is one of the most beautiful telescopic objects in the sky. It is the double star cluster known as "the Great Cluster of Perseus," and is situated in the sword-hand of the Champion. It is a fine sight, even in an opera glass, and you must not fail to look for it.

The glory of this gorgeous spectacle is indescribable. In one of these clusters, at least one hundred stars may be seen in an area less than one quarter as broad as the face of the full moon.

It was in the neighborhood of Algol that a new star blazed out February 22, 1901. It was discovered by Dr. Anderson, of Edinburgh. Within a day it was as bright as Capella, but a week later it had lost considerable of its brightness, and at the end of the year was no longer visible to the naked eye.

According to the old story, Perseus was the son of

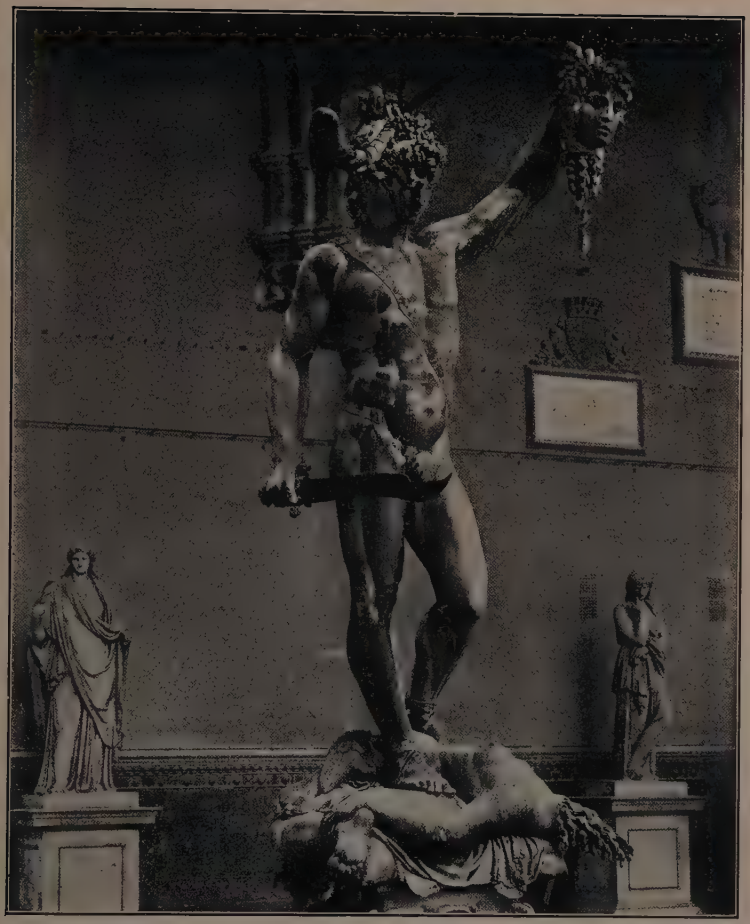


Photo by Brogi

Perseus and Medusa

Bronze by Cellini at Florence

Jupiter and Danæ. He was feared even in his infancy by his cruel grandfather Acrisuis, who, in order to put him out of the way, placed the infant Perseus and his mother in a chest and cast it into the sea. But our hero was destined to a nobler fate, and he and his mother were rescued from a watery grave by some fisherman, who carried the infant and his mother to Polydectes, King of Seriphus. The King had a kind heart and entrusted Perseus and his mother to the care of the priests of Minerva's temple. The youthful Perseus displayed such attractive qualities that he soon became a great favorite with the gods. At this point the stories vary a bit, but the one that seems most in keeping with the Champion's noble character continues as follows: Perseus, in order to prove his gratitude to his Royal benefactor, determined to obtain the Medusa's Head to present to the King at a great feast which he was to give.

Medusa was the name of one of the three sisters who were called "the Gorgons." They were terrible creatures, with tusklike teeth, brazen claws and yellow wings. Their bodies were covered with impenetrable scales, their heads were crowned with hissing snakes instead of hair, and to look at one of them was to be turned into stone. Thus you will see that to secure Medusa's Head was a task to daunt the stoutest heart.

Luckily the gods favored Perseus with some very useful gifts for his perilous journey. Pluto gave him a helmet which rendered the wearer invisible.

Minerva a shield that shone like a mirror, and Mercury bestowed on him winged sandals that enabled him to fly through the air with ease, and a beautiful diamond dagger.

Perseus, thus equipped leaped into the air, and guided by Minerva, discovered the three Gorgons asleep in a sea cave near Tartessus. He knew that one look at Medusa would turn him to stone and wisely held his shining shield so as to catch the reflection of her face in it, and then, with a swift backward stroke with his magic weapon, he cut off her head with one blow, and flew off with it.

> The victor Perseus, with the Gorgon's head,
> O'er Libyan sands his airy journey sped,
> The gory drops distilled, as swift he flew,
> And from each drop envenomed serpents grew.

It is said that ever since this time the sandy desert of Lybia has been infested with snakes.

You can imagine how delighted Perseus must have been to be able to present such a valuable gift to King Polydectes.

The deed made our hero immortal, and at his death the gods placed him among the stars with the head of Medusa by his side. Later you will be told another noble deed that Perseus performed that relates to another of the star-pictures.

ANDROMEDA
THE CHAINED LADY

Algol
Almach
γ
Gloria
Frederike
Gt. Neb.
ν
Over Head
μ
σ
12°
Mirach
β
π
8°
ANDROMEDA
δ
7°
Alpheratz
α
The Great Square of Pegasus
Triangulum
ε
ζ
η

ANDROMEDA

ANDROMEDA (an-drom'-e-da)—THE CHAINED LADY. (Face East.)

> And there revolves herself, image of woe,
> Andromeda, beneath her mother shining.

THE star-picture of Andromeda as it rises in the eastern sky in the early evening about October 1st, presents an extremely beautiful appearance. The map of this region of the sky shows it as it appears in November, much higher in the sky, and not so well placed for observation as it is earlier in the autumn.

You will observe that the picture is located to the right of Perseus, and below Cassiopeia. The stars Almach in Andromeda, Algol and Algenib in Perseus, form a right-angled triangle which in this case is like the letter "L" reversed, thus: ⌋, with Algol at the point where the lines meet.

Start with Almach which is a trifle fainter than Algenib, and to its right, and at a distance a trifle greater than that separating Almach and Algol you will see a star about as bright as Almach, which is the star called "Mirach." Proceeding to the right, a short distance on the same line brings you to "δ," Delta, and the last of the four bright stars in Andromeda, called "Alpheratz," lies above and to the

right of Delta. Delta, you will see, is about midway between Mirach and Alpheratz.

The diagram shows this line of four stars clearly. It is a beautiful sight to see these stars rising over the eastern hills in the crisp air of the early autumn evenings. They resemble a line of lanterns swinging from an invisible wire across the eastern sky, lighting the way for the figures that follow after them up the sloping sky.

This star-picture is closely allied to the picture of Pegasus, the Winged Horse, its neighbor on the right, which I will show you some other night. Now I must call your attention to one of the stellar landmarks which is directly before us as we look at Alpheratz.

You will notice on the diagram the object I have reference to, "the Great Square of Pegasus," marked out by four stars nearly an equal distance apart. Alpheratz is the left-hand one of the four at this time, the remaining three stars that form the square are in the star-picture of Pegasus.

It is always well to know prominent figures in the sky such as this, for it makes you independent of the North Star when you wish to get your bearings at night in case clouds should obscure the northern sky. In late Arabian astronomy the star Alpheratz was known as "the Head of the Woman in Chains," and similarly in England two centuries ago it was called "Andromeda's Head." The spectroscope reveals the fact that there is a giant dark star circling about Alpheratz.

Almach is a triple star; where we see one star with the naked eye a good telescope reveals three stars, two of which can be seen in a small telescope of three-inch aperture. The stars are gold and blue in color, and the contrasting colors are very beautiful. This is one of the finest telescopic objects of its kind in the sky.

A shower of meteors known as "the Bielid Meteors," because they are thought to be connected with Biela's Comet, is to be seen in this region of the sky in November and are worth looking for. In passing, it may be well to mention that these objects are not really stars, and should not properly be called "shooting stars" even if they do resemble them. The meteors are merely masses of matter of various sizes attracted to the earth. Like moths darting toward a brilliant light, they speed in our direction unseen by us until they reach our atmosphere, where they are set on fire by friction, as a match-head is when we draw it across a piece of sand-paper, and we see them in flames streaking across the sky leaving a fiery train. Most of the meteors are small and are burned up in their flight, and only their ashes reach the earth, but occasionally a very large one is only partly consumed and the remainder strikes the earth, often lighting up the whole countryside and buries itself in the ground, frequently exploding. We have many fragments from these meteors in our museums. Commander Peary brought back a huge one from Greenland which is on exhibition in New York City. It is an irregular shaped

mass of great weight composed chiefly of iron and nickel.

There is an attractive little star-picture in this region of the sky just above Andromeda called "Gloria Frederika," or "Frederick's Glory." The diagram shows its position in the sky. It is a "Y" shaped figure composed of four faint stars.

The chief feature in the star-picture of Andromeda is the Great Nebula, the only one in the sky that can be easily seen with the naked eye, although, according to one of the best authorities, there may be 150 thousand of them in the sky. The Great Nebula is a wonderful object which you must be sure to find.

A nebula is gaseous in its nature and cloud-like in appearance. The Andromeda nebula, the position of which is shown on the diagram a short distance above Mirach, is a small hazy patch of light that you can see very well if it is a clear night and the moon is not in the sky. An opera glass reveals its nebulous character which is quite unlike the appearance of the stars. You will not think that it is much of a sight to look at, but in reality it is one of the most remarkable objects that the human eyes behold, if not the most marvelous.

This "Queen of the Nebulæ," as it has been called, was known as far back as the year 905, and in early days was described as the "Little Cloud." Simon Marius observed it December 15, 1612, and wrote that it resembled "the diluted light from the flame of a candle seen through horn," which is a good description as it appears to us to-day.

Photo by Hanfstaengl

Perseus and Andromeda
(Berlin)

Close study of the nebula has revealed that it is spiral in shape, resembling a loosely coiled spring, and that it is rotating on its axis with tremendous speed, much in the manner of an oval-shaped pinwheel such as the boys set off on Fourth of July.

The extent of this glowing cloud is beyond our thought or imagination. According to one estimate of its breadth the long way of its axis, it is more than 500,000 times the sun's distance from the earth in miles. The sun's distance from us is about ninety-three million miles, and you now have some idea of the size of this faint nebulous object that seems of no consequence whatever.

It is an enormous distance away from us, in fact everything that we know about the nebula excites our wonder and amazement. You must think of this when you look at this marvelous sight.

The books on astronomy will give you a great deal of information about the nebula which is out of place here, and many fine photographs of it have been taken by our largest telescopes which you will be glad to see now that you have seen this sky-wonder with your own eyes.

The story of Andromeda is a very old one. Her father was King Cepheus, her mother the beautiful but unfortunate Cassiopeia, so that we are already acquainted with her parents. You recall in the story of Cassiopeia that the Queen enraged the sea nymphs by boasting of her beauty, and that Neptune, to punish Cassiopeia, decreed that her cherished daughter Andromeda should be chained to a rock

on the shore, where she would fall a prey to the terrible sea monster that had been sent to ravage the coast of Ethiopia.

Thus we find the unhappy maiden with the chains about her wrists and ankles, bound to a rock by the sea awaiting her cruel fate.

> Chained to a rock she stood, young Perseus stay'd
> His rapid flight, to woo the beauteous maid.

But now the hero appears on the scene, the gallant Perseus returning through the air with the Medusa's Head happy in the thought of his success. From afar he spied the hapless maid, and at once alighting to learn the cause of her distress, he naturally fell in love with her at first sight. You can well imagine how delighted Andromeda was to realize that a defender was at hand, and such a handsome young man besides.

Suddenly, the awful sea monster appeared in the distance seeking to devour Andromeda. Whispering words of encouragement to the beautiful Andromeda, and bidding her shut her eyes lest the sight of the Medusa's Head would turn her to stone, our hero leaped into the air.

Charles Kingsley thus beautifully describes the approach of the monster of the deep: "On came the great sea monster, coasting along like a huge black galley, lazily breasting the ripple, and stopping at times by creek and headland to watch for the laughter of girls at their bleaching, or cattle pawing

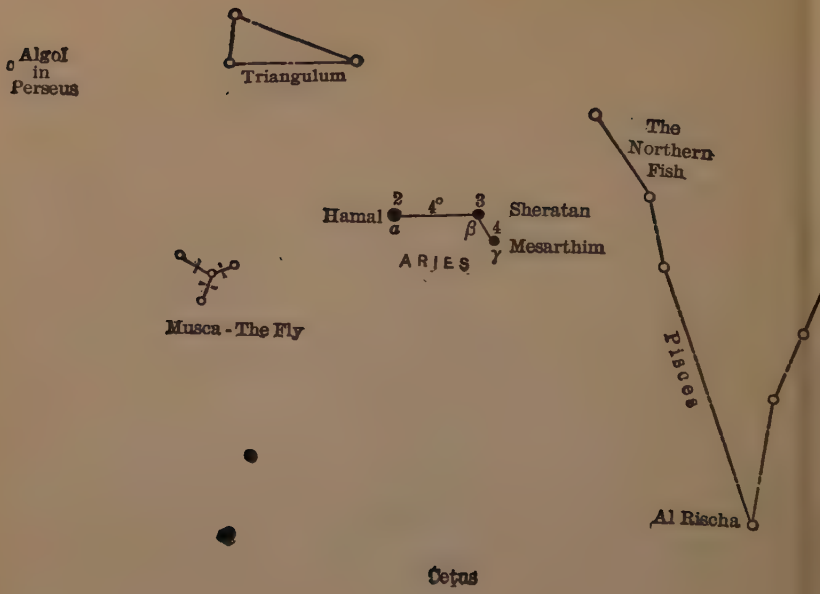
on the sand hills or boys bathing on the beach. His great sides were fringed with clustering shells and sea weeds, and the water gurgled in and out of his wide jaws as he rolled along, dripping and glistening in the beams of the morning sun. At last he saw Andromeda and shot forward to take his prey, while the waves foamed white behind him, and before him the fish fled leaping. Then down from the height of the air fell Perseus like a shooting star, down to the crest of the waves, while Andromeda hid her face."

It was all over in a minute. Perseus flashed the Medusa's Head before the eyes of the monster, and when Andromeda opened her eyes she beheld nothing but a great black rock, over which the sea was breaking where once the sea monster had been.

Perseus at once released the maiden and took her to her fond and bereaved parents, who you may be sure were delighted to have their daughter restored to them, and made much of her saviour.

Of course Perseus married Andromeda and they lived happily ever after, and even in the sky, where the gods placed them at their death, we find them near together as true lovers should be.

ARIES
THE RAM


Algol
in
Perseus
Triangulum
The
Northern
Fish
Hamal
Sheratan
Mesarthim
ARIES
Musca - The Fly
Pisces
Al Rischa
Cetus

ARIES

ARIES (ā′-ri-ēz)—THE RAM. (Face Southeast.) TRIANGULUM. THE TRIANGLE.

Beneath Andromeda, three lines compose
The Triangle. On two sides measured equal
The third side less.

ARATOS.

DIRECTLY below Andromeda, and to the right of Algol, you will see the small but attractive star-picture called Triangulum, the Triangle, composed of three fairly bright stars. The figure was at one time called "Delta," as it resembles the Greek letter of that name.

First from the east, the Ram conducts the year.

Below the Triangle and a little to the right is a small but important star-picture that bears the name of Aries, the Ram. The diagram shows its position clearly. A line drawn from Polaris to Almach in Andromeda, extended twenty degrees, passes through the Triangle and locates Hamal, the brightest star in the Ram. Twenty degrees is twice the distance separating Dubhe and Megrez in the Great Bear. It is very convenient to have a measuring rod of this sort when we survey the sky.

Hamal is a yellowish star, a trifle fainter than Polaris. The star name is an Arab one, meaning "a Sheep." This was a very important star in ancient days, and bore names such as "Arietis," "Lulim" meaning "the Ram's Eye," and "Simal" or the "Horn Star." At least eight of the Grecian temples were dedicated to the worship of this famous star. It is approaching us at the rate of nine miles a second, but as it is forty light-years away there is no danger of a collision in our time.

The Arab star name Sheratan, means "the Sign." Close to it is the star Mesarthim, which has been called the "First Star in Aries." It is a beautiful double star in a small telescope, and was discovered by Dr. Robert Hooke in 1664, being one of the first double stars discovered.

The importance of the star-picture of the Ram lies in the fact that it is the first sign in the Zodiac, but for reasons which it is not necessary to discuss here it is now the second star-picture or constellation in the Zodiac.

The Zodiac is simply the imaginary pathway in the sky, which the sun, moon, and planets appear to travel along each year. It is divided into twelve equal parts, just as the dial of a watch is, and as we see the hands of the watch circling about the dial, revealing the time of day to us, so the sun, the golden hand of the world's great timepiece, jeweled with stars, appears to circle on its well-worn path, revealing to man the time of year.

The twelve divisions of the Zodiac are each marked

by a star-picture, and as the Ram is the first one of these pictures that we have come to in our study of the sky, it is well at this point to tell you a little more about this time-honored pathway circling the heavens.

Probably every nation on earth in early times has had a Zodiac, made up for the most part of animals. Just why animals were selected to mark the twelve divisions of the year, we do not know. Of course in olden times there were no clocks, and it may interest you to know how the Zodiac was divided into twelve equal parts.

First a jar was filled with water which was allowed to drip through a tiny hole drop by drop into another jar placed below it. As the first drop fell they made a note of what bright star was rising in the eastern sky. All day long the drops fell one by one, and when the star they had marked appeared again in the same place, they removed the upper jar, and had in the lower one the amount of water that had dropped into it in twenty-four hours. This water they divided into twelve equal parts, and they procured twelve small jars, each capable of holding a twelfth part of the water. They now poured all the water into the first large jar and placed under it one of the small jars, which they began filling drop by drop. They repeated this process with all the twelve small jars, noting the star that was rising as each small jar was filled. In this way they divided the sky into twelve equal divisions and each was clearly marked in the sky with a star. Around these stars they

grouped others, thus forming the star-pictures of the Zodiac that have come down to us.

They called the first star-picture of the Zodiac "the Ram," as sheep raising was an important feature of the life of early times, and the Ram was a suitable leader for the flock of stars that followed along the path they had marked in the sky.

The twelve signs of the Zodiac are very important and as we will study all of these star-pictures, it is well to remember the names as they come in order. To assist you in this the following lines of an old rhyme are worth memorizing:

> The Ram, the Bull, the Heavenly Twins,
> And next the Crab, the Lion shines,
> The Virgin, and the Scales.
> The Scorpion, Archer, and the Goat,
> The Man that pours the Water out,
> The Fish with glittering tails.

A great deal that is interesting could be written about the Zodiac, but it is out of place here, and we must pass on now to the story of the Ram.

Aries has been called the "Prince of the Zodiac," "Prince of the Celestial Signs," and the "Leader of the Host of the Zodiac."

According to one legend this is the Ram into which Zeus, the most powerful of all the ancient gods, changed himself, to escape the pursuit of the giants.

The well-known story of the Ram that has come down to us relates that this is the famous Ram with the fleece of gold.

The golden fleece, you remember, was the object of the Argonaut's heroic quest.

According to the story, Phrixus and Helle were the children of Athamas, King of Thessaly. Their stepmother treated them cruelly. Mercury took pity on them and sent a Ram with golden fleece to enable them to escape from their wicked mother. This they were glad to do, and mounting on the Ram's fleecy back they were borne through the air over land and sea. Helle unfortunately fell from the Ram's back while they were crossing the strait dividing Europe from Asia. In memory of this sad event this strait was ever afterwards known as the "Hellespont," but better known perhaps as the "Dardanelles."

The poet Manilius has recorded the fact in the following lines:

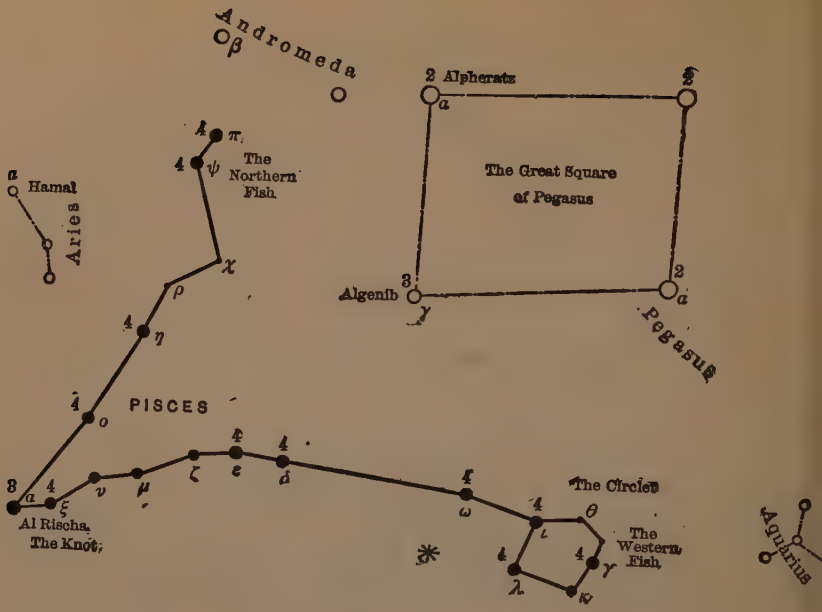
> First golden Aries shines, who whilst he swam
> Lost part of's freight and gave to sea a name.

Phrixus landed safely at Colchis, at the eastern end of the Black Sea. In gratitude for his safe deliverance he sacrificed the Ram and gave its golden fleece to Ætes, the King of the Country, who hung it in the sacred grove of Ares, where it was guarded by a dragon that never slept.

The fleece was later carried off by Jason and the Argonauts, but that is another story.

Jupiter placed the faithful Ram among the stars, where now it is a link in the golden girdle encircling the sky.

PISCES
THE FISHES


Andromeda
β
2 Alpheratz
α
The Great Square
of Pegasus
Algenib
γ
Pegasus
The
Northern
Fish
Hamal
Aries
PISCES
The Circlet
The
Western
Fish
Aquarius

PISCES

PISCES (pis′-ēz)—THE FISHES. (Face South-east.)

And here fantastic fishes duskily float.
MRS. BROWNING.

To the right and below Aries, and in the Zodiac, you will see by consulting the diagram the star-picture of Pisces, the Fishes.

Two lines of faint stars form a rude letter "V" with long extended sides. The Great Square of Pegasus lies just above this "V," and if it should chance to fall, would be securely wedged in it!

The Fishes, as you will see in the picture, have ribbons tied about their tails; these ribbons are joined and knotted together, and thus the Fishes can never get away from each other, and are prevented from swimming about in the sky.

The little circle formed by faint stars called "the Circlet," where the Western Fish is located, is an attractive object which you will have no difficulty in seeing if it is a clear night. It is situated just below Pegasus.

The spot marked by a star "*," a little to the left of the Circlet, shows you the Vernal Equinox, which is not as bad as it sounds. This is simply the point on the path of the Zodiac where two imaginary lines

meet. These lines are traced out on the sky for reasons that we need not discuss here. On the first day of spring the sun reaches the crossing point of these lines, which is the place in the sky marked by the "*."

The following illustration will help you to understand this matter a little better: Imagine that the sun is an automobile that is speeding around a circular track, which we will call the Zodiac. The track is crossed in several places by state roads, and the crossing points are all named, just as many of our grade crossings are. The place in the sky I have called your attention to is the crossing called "Vernal Equinox," that the automobile reaches the first day of spring each year.

The Babylonians, Syrians, Persians, Turks, and Greeks, all regarded this star-picture as representing two fishes. The part of the sky that they occupy, and quite a large region about it, was known in very early times as "the Sea," and here we find, as we would expect to, the Dolphin, the Fishes, and as we will see later, the Whale and the Sea-Goat.

The two Fishes are known as the "Northern Fish," which is located just to the right of Aries, and the "Southern Fish," which you will see below Pegasus.

The Arabs knew the two ribbons tied about the tails of the Fishes as the "Flaxen Thread." These ribbons are joined in a knot marked by the star Al-Rischa, meaning "the Cord."

According to the old Greek story: The beautiful Venus and her son Cupid were one day walking on the

banks of the River Euphrates. Suddenly, they saw approaching the terrible giant named Typhon, who had, it is said, one hundred heads like those of a serpent, and flames of fire darted forth from his mouth and eyes, which must have caused the Fire Department of those times considerable anxiety.

Venus and Cupid were naturally terrified at the sight of this awful creature, and to escape from him threw themselves into the river and took the form of two fishes. When Typhon arrived on the scene his prey had vanished, and you can picture his disappointment. To commemorate this fortunate event Minerva placed two Fishes among the stars, where they have seemed quite contented ever since.

Many people in olden times thought that the stars had great influence over the lives of men and women and affairs of state. Before deciding anything of importance they consulted the stars through their wise men, and these men informed them as to what they should, or should not, do.

Some of the star-pictures were favorites, and anyone born when they were rising, or prominent in the sky, was, they thought, sure to be lucky all the rest of his days. Other pictures were just the reverse, and were thought to have an evil influence over the lives of men. The star-picture of the Fishes was considered most unlucky. Both the Syrians and Egyptians refused to eat fish on this account, and the picture of a fish in Egypt was considered as an odious sign.

Of course, nowadays, we do not believe that the stars concern in any way the lives and plans of mankind, for we know that they are too far away to have any sort of an effect of this kind on us.

TAURUS
THE BULL

Auriga
Nath
β
Alcyone
The Pleiades
η
Gemini
φ
TAURUS
κ
ζ
The
Hyades
δ
Aldebaran
α
σ
γ
μ
ξ
ν
Betelgeuze
in
Orion

TAURUS

TAURUS (tau'-rus)—THE BULL. (Face East.)

I mark stern Taurus, through the twilight grey.
Taylor.

FOLLOWING Auriga and Perseus up the slopes of the eastern sky, there rises in the early evening in mid-autumn, the beautiful star-picture of Taurus, the Bull.

Taurus is especially well placed for observation about February 1st, when it is seen about due south in the early evening, and about halfway up the sky. By April 1st the Bull has moved into the western sky, and seems to seek the verdant pasture-lands beyond the boundaries of the horizon, where he peacefully spends the summer.

A line drawn from Capella to (*ι*) Iota in Auriga, extended a little over its length, points to the red star Aldebaran that marks the eye of the Bull. Aldebaran is also located by drawing an imaginary line from Alpheratz in Andromeda through Hamal in Aries, extending the line a distance a trifle more than its length. The star is unmistakable because of its ruddy hue. This "ruby of dazzling hue" is one of three red first-magnitude stars in the sky. It rises in the east at eight o'clock the middle of October, and with its glittering attendant stars, the cluster

known as "the Hyades," presents a beautiful sight, as, like a king attended by his courtiers, he majestically ascends the eastern sky to his starry throne.

Aldebaran and four faint stars in the Hyades form a "V" shaped figure. In the autumn the "V" lies on its side thus: > as it is rising.
Aldebaran

The name Aldebaran in the Arab tongue means "the follower." It received this name because it follows in the sky the famous cluster of stars called "the Pleiades" that are a part of the star-picture of the Bull.

Taurus is the only star-picture in the sky that contains two naked-eye star clusters of note, and for this reason, and because it lies in the Zodiac, this star-picture has become famous in song and story in all ages of the world's history.

Look at the beautiful clusters of the "Hyades" and "Pleiades" with your opera glass if you would behold an entrancing sight. Because of the importance of these clusters they deserve separate chapters in which to relate the interesting stories concerning them, for they have received universal attention since man first raised his eyes to the starry skies.

Only half of the figure of the Bull is to be seen in the star-picture, just as in the case of Pegasus, only half of the Horse appears. The unseen part of the Winged Horse is hidden by imaginary clouds. In this case the Bull is supposed to be swimming with his hindquarters submerged beneath the waves. His horns are tipped with golden stars, and on the old

charts he is represented as advancing to attack Orion the Giant Hunter.

> Go forth at night
> and talk with Aldebaran where he flames
> In the cold forehead of the wintry sky.
>
> MRS. SIGOURNEY.

Aldebaran was known to the Arabs as "the Eye of the Bull," and, strangely enough, they also called this ruddy star "the Great Camel." To the Hindus it was known as "Rohini," meaning the "Red Deer," while the ancient Akkadians called it "the Furrow of Heaven." Thus we have quite a choice of names for this famous star, but the "Eye of the Bull" seems the most appropriate.

In spite of its rather sinister appearance, Aldebaran was always considered a fortunate and lucky star. It was one of the four "Royal Stars," or Guardians of the Sky of Persia 5000 years ago.

Aldebaran is forty-five light-years away from us and said to be receding from us at the rate of thirty miles a second. Authorities claim that it gives out 160 times as much light as our sun. Think what a glorious sight this ruddy sun must be from planets that possibly circle about it, and the sublime beauty of the sunrise in those distant lands. Aldebaran occupies the fourteenth place in the order of brightness of all the stars in the sky.

Aldebaran is one of three first magnitude stars that are red in color, the other two being Betelgeuse in Orion, and Antares in Scorpius. Few know that

we can tell a star's age by its color, but such is the case.

The giant red stars are the youngest, the three stars named above falling in this class, then come the yellow stars followed by the blue stars which are intensely hot and have reached the apex of their physical activity and vigor. An example of this class is the beautiful star Vega. Next, are the yellow stars, declining in age in which class is our sun.

The dying stars are the dwarfs, and red in color. They have shrunk in size and are losing their incandescence. Thus we have red as a color indicating both youth and old age in stars, and their size informs us as to whether they are young or old.

The star Nath, or "El Nath" as the Arabs called it, means in their tongue "the Butting One." It is a star that is common to the star-pictures of Auriga and Taurus.

> The tip of the left horn, and the right foot
> Of the near Charioteer, one star embraces.
>
> ARATOS.

The star ζ Zeta which is below Nath marks the tip of the Bull's right horn. In olden times for some reason or other, this star was supposed to have a mischievous influence over people. The central line of the Zodiac passes between the horn's of the Bull. It is called "the Ecliptic."

Taurus, beyond doubt, is one of the oldest of the star-pictures, and for that reason it is teeming with interest. You must not be satisfied with the few

Photo by Naya

The Rape of Europa

Painting by Veronese. In the Ducal Palace, Venice

stories that this book contains about the star-pictures, but must seek further for many interesting and entertaining stories that the people of many lands have written concerning the star-sown skies.

Over four thousand years ago, the Bull marked the Vernal Equinox, the place in the sky that the sun reaches the first day of spring, which, as we have seen, is now in the star-picture of the Fishes. The entrance of the sun into this star-picture was in ancient times the occasion of great festivals and celebrations, and they have even come down to our day in the May Day festivals when children go to the parks and dance about the May-Pole.

In the study of the history of olden times we find the worship of the Bull almost universal. Centuries before the time of Christ we find that the Bull was worshipped in Persia and Babylon. Among the Egyptians Taurus was considered an emblem of immortality, or a perpetual return of life, and the celebrations in honor of the Bull are very like in their significance to our Easter celebration that commemorates the Resurrection.

Once upon a time, according to an old Greek story, there lived in Phœnicia a very beautiful maiden named Europa. She was the daughter of the King, and the fame of her beauty spread into far lands so that it was natural that the gods who were at that time supposed to rule the world should hear of it. The great god Jupiter, having seen Europa was completely infatuated with her, and in order to be near her he changed himself into a snow-white bull

and joined the great herd of cattle that the King kept.

Europa and her girls friends were one day having a picnic party on the seashore, and as they wandered about gathering flowers, the beautiful bull approached them. He appeared to be so tame that Europa ventured to go close to him, and stroked his snow-white coat. She even dared to climb up on his back, but this was a fatal mistake, for no sooner was she seated than the bull dashed with her into the sea, and carried the terrified Europa safely to Crete where Jupiter revealed himself and won Europa as his bride.

The poet Tennyson thus refers to this exciting adventure:—

> Sweet Europa's mantle blew unclasp'd,
> From off her shoulder backward borne;
> From one hand dropp'd a crocus; one hand grasp'd
> The mild bull's golden horn.

There is a beautiful painting by the noted artist, Paul Veronese, hung in the Ducal Palace in Venice that shows Europa sitting on the back of the bull.

We must now pass on to the stories about the famous star clusters in Taurus, the "Hyades" and "Pleiades."

THE HYADES

THE HYADES

Who hears not of the Hyades, sprinkling his forehead o'er?

ARATOS.

THE "V" shaped cluster of stars known as the Hyades is one of great beauty. The loveliness of the group is shown in an opera glass which reveals many seemingly happy mated jewels of various hues.

The ruddy Aldebaran lights up the group, and the fainter stars we can liken to courtiers that follow in the steps of their royal master.

The cluster has from ancient times been associated with the rainy season, perhaps because of the fact that the group rises in the fall of the year when we expect storms and bad weather that usher in the winter's reign of desolation. Thus we find the cluster referred to as "the rainy Hyades," and the poet Manilius calls them:

the sad companions of the turning year.

Various are the names given this star cluster by different people. We find it called "a Torch," a "Triangular Spoon." The Arabs knew the group as

"the Little She Camels," Aldebaran representing the large Camel.

The Hindus pictured here a wagon or temple, and the Chinese a net, although they called the cluster "the Star of the Hunter."

The early tribes living along the banks of the Amazon River in South America called the Hyades the "Jaw of an Ox."

The whole cluster seems in some way intimately related, as its stars are all receding from us at the rate of twenty-five miles a second. Like a flock of wild geese flying southward at the approach of winter this group of stars seems to seek a milder clime than ours beyond the reaches of infinity.

The Hyades were supposed to be the five daughters of Atlas, King of Mauretania, and half-sisters of the Pleiades. They were changed into stars on account of their grief for the death of their brother Hyas, who was killed by a wild boar. Their sorrow was said to have been so great that they pined away and died. The gods pitying them changed them into stars and placed them together in the sky. They bear these attractive names:—Phaola, Ambrosia, Eudora, Coronis, and Polyxo. The fact that they shed such copious tears in their great grief may be the reason for the moist and watery reputation that they have always borne.

According to another story the Hyades were the nurses of the infant Bacchus, and on their death Jupiter rewarded them for their faithful service by placing them among the stars.

With the Pleiades, the Hyades are the heralds that announce the coming of the brightest stars in the firmament, the glorious pageant of the winter stars that pass in nightly review before the Frost King.

THE PLEIADES

THE PLEIADES

The group of sister stars, which mothers love
To show their wondering babes, the gentle seven.
BRYANT.

WE now come to what many consider the most interesting of all the star-pictures, certainly the most celebrated cluster of stars in the sky, for all the great nations and peoples of early times have felt the mysterious influence and charm that surrounds the Pleiades and worshipped them.

In spite of the fact that the cluster contains no conspicuously bright stars, it is probably the best known of all the star-pictures. Rising in the southeast in the early evenings of autumn the cluster immediately attracts attention.

You can locate its position accurately by drawing an imaginary line from (γ) Gamma in Cassiopeia to Algol in Perseus and extending it a short distance. A similar line drawn from Algenib in Pegasus to Aries and extended an equal distance furnishes another guide to the cluster.

You should be able to see six stars in the group easily, and if you are keen of sight you will probably see seven or more, for there are a number of faint stars just at the limit of visibility that have a fas-

cinating and charming way of winking at us for an instant and then retreating from our view, flashing for all the world like fireflies on a dark night in summer.

The poet Tennyson has thus expressed this pretty fancy in describing the cluster:—

Like a swarm of fireflies tangled in a silver braid.

Bayard Taylor likened the group to a swarm of bees upon the mane of Taurus, and the seven stars form a dipper-shaped group which has led many to call the cluster erroneously "the Little Dipper," the proper name for Ursa Minor, the Little Bear.

The cluster is mentioned in the Bible in the following lines:—"Canst thou bind the sweet influences of the Pleiades?" The charm and witchery of these twinkling timorous stars have come down to us through the ages, and even in this later day when men seldom raise their eyes to behold the beauty that the night skies reveal, the Pleiades fascinate and delight all who behold them.

It is worth while bearing in mind when we look at the Pleiades and are only able to see seven stars in the group, that three thousand stars have been counted on a photograph of the cluster taken with one of our great telescopes, and that the entire group is caught in a net, as it were, of cloud-like matter that astronomers call a nebula. Like the Hyades, the stars in the cluster are moving in the same direction as if the net which enfolds them were being drawn by an invisible hand into the fold of infinity.

We find the Pleiades mentioned in China over two thousand years before Christ was born. The Egyptians worshipped these beautiful stars and called the cluster "Atauria," meaning the stars of Athyr, (Hathor).

The Pleiades were objects of importance and worship among the Aztecs, the early inhabitants of Peru, the Japanese, and the Hindus. All these people held festivals in memory of the dead in the month of November when the Pleiades reached their highest point in the sky at midnight. Even today we celebrate All Saint's Day and All-Hallows Eve at this season of the year, and the history of these festivals can be traced back to the old custom of worship of the Pleiades.

There is surely a great mystery here, for why should the people of so many lands widely separated from each other be particularly interested and attracted to this group to the point of worship, and why should they all, including ourselves, have celebrated the event of their midnight culmination? We should never gaze at these beautiful stars without thinking of the great historical and religious interest they possess.

The appearance of the Pleiades in the sky was, in ancient times, a matter of great interest to the farmers and tillers of the soil. Their rising with the sun heralded the summer season, and when they rose at sunset men knew that winter was at hand. In spite of the fact that South Africa and Peru in South America are widely separated, the natives of the

former country called the Pleiades "the hoeing stars," while for the Peruvians they also had an agricultural significance, as the natives thought that the Pleiades governed and even created the crops.

There is a tremendous amount of interesting lore concerning the Pleiades but space does not permit of recording it here, and we will pass on to the stories relating to this famous star cluster.

The Hottentots had a curious idea concerning these stars. They said that they represented wives who shut their husbands out because they were poor marksmen and failed to hit the game they were hunting.

Our American Indians regarded these stars with wonder, and believed that they represented seven young men who guarded the holy seed during the night, bearing out the widely known agricultural significance of this star group.

One of the Indian stories about the Pleiades relates that once upon a time a party of Indians were out hunting, and having found a place where game was plentiful, they put up their wigwams while the children gathered to dance and sing. Presently an old man dressed in white feathers, with white hair that shone like silver, appeared among the children and ordered them to stop dancing lest evil befall them; but the children kept on dancing in spite of the warning, when all of a sudden they felt themselves rising in the air. One exclaimed, "Do not look back for something strange is taking place," but one of the children was disobedient and looked

The Dance of the Pleiades
Painting by Elihu Vedder

back, when immediately the child became a falling star. The other children reached the sky in safety, and we see them there in the star cluster of the Pleiades.

According to another Indian story, there were once seven brothers who took the war path. One day they chanced to come upon a beautiful maiden living alone whom they adopted as their sister. One day they all went hunting except the youngest who remained behind to guard their adopted sister; but after a time he, too, went off hunting, leaving the maiden unprotected. Soon after he had gone a great buffalo appeared and carried off the maiden. The brothers on their return were distressed at their loss, and immediately started in pursuit. They finally discovered that their sister was imprisoned in a lodge in the very centre of a herd of fierce buffaloes. The youngest brother, to make up for his carelessness in leaving his sister, tunneled a way under the buffaloes and into the lodge, and he and his sister escaped through the tunnel. On their return home the brothers put up a very high iron fence about their home to protect their sister for they felt sure that the buffaloes would try to carry her off again. Soon after, the buffaloes enraged at their loss, attacked the Indians, beat down their fence with their hoofs, and would have killed the Indians, but just in the nick of time they were carried up to the sky where we see them represented by the stars in the Pleiades, and forever prevented from doing further harm.

A Shasta Indian legend is as follows:—The Coyote and Coon went to a dance together. Returning home the Coyote sent his children for some game he had killed, and when they brought it in, he prepared a grand feast. The youngest child was left out, and in anger told the Coon's children that the Coyote had killed their father. The Coon's children thereupon waited their opportunity when the Coyote was away from home and killed all his children excepting the youngest. On the Coyote's return he looked everywhere for his children and asked all things where they had gone. As he was searching he perceived a cloud of dust rising, and in the midst he saw the Coon's children and his youngest child. He ran after them in vain, and the children rose to the stars where they became the Pleiades. The Coyote's child is represented by the faintest star in the cluster. In winter, when Coons are in their holes, the Pleiades are most brilliant, and continually visible. In summer, when Coons are out and about, the Pleiades are not to be seen.

In mythology, the Pleiades were the seven daughters of Atlas and Pleione; Atlas was the great giant who bore the whole world upon his shoulders. It is said that the Pleiades were placed in the sky because of their many good qualities, and for the love they bore each other, but another story relates that they were thus honored because of their sorrow at the task imposed on their father. In this regard they are like the Hyades, that were also said to have been placed in the sky by the gods out of pity for their grief.

The names of these seven charming sisters have come down to us. They are very attractive names and the poet Aratos thus records them:

These the seven names they bear
Alcyone, and Merope, Celæno,
Taygeta, and Sterope, Electra,
And queenly Maia, small alike and faint,
But by the will of Jove illustrious all
At morn and evening, since he made them mark
Summer and winter, harvesting and seed time.

The Pleiades have been likened to doves. It is said that Orion, the giant hunter of the sky, was very much taken with the beauty of the seven sisters. He would have called on them every evening if he could, but they did not fancy him at all, and as he insisted on coming to see them they besought Jupiter to help them. Jupiter accordingly took pity on them, changed them into doves and they flew away to the sky where we see them in the Pleiades. Orion has also a place in the sky not far from them, but luckily the Bull is near at hand to protect them, and they are safe from his advances.

The Eskimos call the Pleiades "the Bear," and this is their story about the stars:

"A number of dogs were pursuing a bear on the ice. The bear gradually rose up in the air as did the dogs, until they reached the sky. Then they turned to stars and the bear became a larger star in the centre of the group, and is represented by the star Alcyone."

One of the strangest facts concerning the Pleiades is the almost universal belief among the people of the ancient world that one of the seven sisters was lost or grew dim. The poet Aratos wrote:

> As seven their fame is on the tongues of men,
> Though six alone are beaming on the eye.

There is little doubt that one of these stars was at one time brighter than it appears to us to-day.

There are many interesting stories to account for the "lost Pleiad," as it is called, though there seems to be a difference of opinion as to which of the seven sisters was lost. Some say it was Electra, the mother of Dardanus, the founder of Troy, who hid her face in order that she might not see the destruction of that city. The Greeks thought it was Merope who married a mortal, for which she felt disgraced and withdrew from the company of her sisters. According to another story, one of the Pleiades was struck by lightning and removed into the tail of the Great Bear.

The Iroquois Indians also had a legend respecting this famous star that appears to have been lost. They imagined that the Lost Pleiad was a little Indian boy in the sky, who was very homesick. When he cried he covered his face with his hands and thus hid his light. The legend is as follows:—"Seven little Indians boys lived in a log cabin in the woods, and every starlight night they joined hands and danced about singing the 'Song of the Stars.' The stars

looked down and learned to love the children, and often beckoned to them. One night the children were very much disappointed with their supper, and so when they danced together and the stars beckoned to them, they accepted the invitation and betook themselves to Starland, and became the seven Pleiades, and the dim one represents one of the little Indian boys who became homesick."

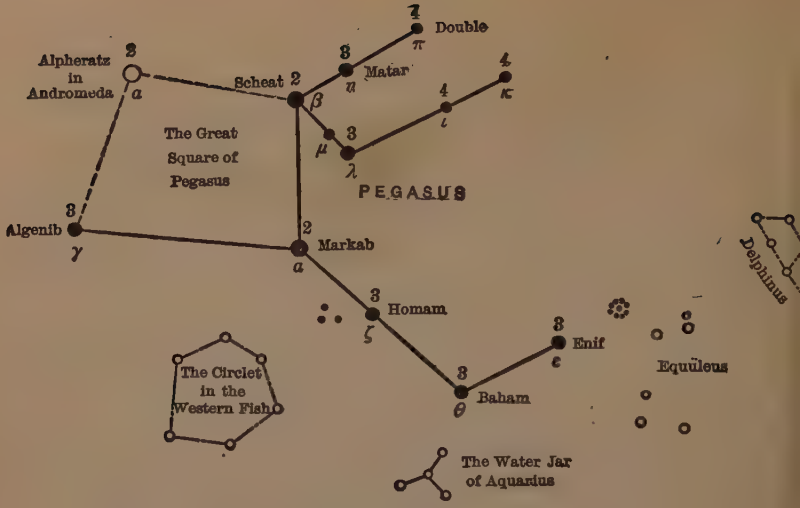
According to another legend concerning the Lost Pleiad, known to be current among the blacks of Australia, the Pleiades represented a queen and her six attendants. Long ago the Crow (the star Canopus), fell in love with the queen, who refused to be his wife. The Crow found that the queen and her attendants were wont to hunt for white edible grubs in the bark of trees, and changing himself into a grub hid beneath the bark. The six maidens sought in vain to pick him out with their wooden hooks, but when the queen tried to draw him out with a pretty bone hook he came out, and assuming the shape of a giant ran away with her. Ever since that time there have been only six stars in the group.

The Dyaks and the Malays of Borneo imagine the Pleiades to be six chickens followed by their mother, who remains always invisible. At one time there were seven chickens, but one of them paid a visit to the earth, and there received something to eat. This made the hen very angry and she threatened to destroy the chickens, and the people on the earth. Fortunately the latter were saved by Orion, the mighty hunter. At that period of the year when the

Pleiades are invisible the Dyaks say that "the hen broods her chickens." When these stars are to be seen they say "the cuckoo calls."

The star Alcyone is the brightest star in the cluster, and is sometimes called "the light of the Pleiades." This star has three companion stars, and the "Queen and her attendants" present a beautiful sight in a small telescope.

PEGASUS
THE WINGED HORSE


Double
π
Alpheratz
in
Andromeda
α
Scheat
β
Matar
η
κ
ι
μ
λ
The Great
Square of
Pegasus
PEGASUS
Algenib
γ
Markab
α
Homam
ζ
Enif
ε
Baham
θ
Delphinus
Equuleus
The Circlet
in the
Western Fish
The Water Jar
of Aquarius

PEGASUS

PEGASUS (peg'-a-sus)—THE WINGED HORSE.
(Face South.)

That poetic steed
With beamy mane, whose hoof struck out from earth
The fount of Hippocrene.

BRYANT.

THE star-picture of Pegasus, the next one on our program, is well placed for observation in the eastern sky about the middle of September, and in the western sky the middle of January. In the early evening in mid-autumn it is well up the southern sky.

Only the head and forequarters of the Horse are traced out by the stars, the rest of the animal being hidden in the clouds, the poets say. Pegasus is never seen in an upright position, so that any resemblance to a horse is difficult to see.

The chief feature of interest in this star-picture is "the Great Square of Pegasus," or "Big Diamond," which I have already pointed out to you at the right of the star-picture Andromeda.

Two parallel rows of stars represent the forefeet of the Horse, which appear to be pawing the sky. Their position is shown on the diagram.

The stars in the figure are of no special interest although many of them have names that have come

down to us, which shows that in early times this was considered an important region of the sky.

Markab is the name for "Saddle" or anything ridden upon. Scheat is a comparatively recent star name. The Arab name for this star meant "the Horse's Shoulders."

Algenib is a name derived from an Arab star name meaning "the Side." Enif signifies "the Nose," and the star is found in the nose of the Horse.

The star "π" (Pi) is an interesting object in an opera glass, as it is a double star which you will enjoy looking at.

The little star-picture or asterism of Equuleus or Equus, the Little Horse as it is called, is worth observing. It is composed of faint stars, and is to be seen just to the right of the star Enif. Its position is shown on the diagram.

The star-picture of Delphinus, the Dolphin, or Job's Coffin, is just beyond Equuleus, and below Pegasus you will see a circle traced out by faint stars which is in the star-picture Pisces, the Fishes. These pictures will occupy our attention at another time.

In the old legends Pegasus figures as the famous steed which sprang from the blood of Medusa after Perseus had cut off her head.

According to the poet Ovid, his abode was on Mount Helicon. It is said that here, by striking the ground sharply with his hoof, he caused water to gush forth, and the famous spring thus formed was called Hippocrene, which may be seen by travelers to this day.

Pegasus was tamed either by Neptune or Minerva,

and for a time one of his duties was to carry the thunder and lightning for Jupiter. His best service, however, was performed as the faithful steed of Bellerophon, the son of Glaucus, King of Ephyre.

Bellerophon assigned himself the task of destroying the Chimæra, a terrible monster that vomited flames of fire from its mouth. It had three heads, that of a lion, a goat, and a dragon. Minerva gave Bellerophon a golden bridle, and with this he succeeded in catching Pegasus as he was drinking from the celebrated fountain at Pirene.

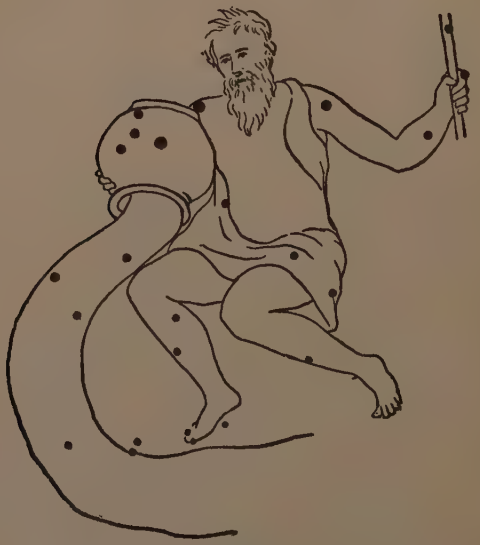
Mounting Pegasus, Bellerophon leaped into the air and flew off to Lycia, the abode of the terrifying Chimæra, and quickly ended its life with his arrows.

Jupiter took offence at Bellerophon because he had presumed to kill the Chimæra without consulting him, and to punish him sent a gad-fly which stung Pegasus just as Bellerophon had mounted him for his homeward journey. Pegasus naturally shied when this happened, throwing Bellerophon from his seat, and the unfortunate youth was dashed headlong to the earth. Pegasus, however, continued his flight upward to the vault of heaven, and Jupiter found for him an eternal pasture-land in the starry fields. Perhaps this is why Pegasus always appears to us to be flying skyward.

As for the spring of Hippocrene that gushed forth when Pegasus struck the ground with his hoof, it is said that anyone who wishes to be a true poet must drink of its magic waters before he can write inspired verses.

AQUARIUS
THE WATER CARRIER

Pegasus
The Water Jar
π
η
ζ
Sadal Melik
γ
α
κ Situla
AQUARIUS
φ
λ
Ancha
θ
Sadal Suud
β
ν
Double
τ
ι
Skat
δ
104
A
Fomalhaut
α
Piscis Australis



AQUARIUS

AQUARIUS (a-kwā′-ri-us)—THE WATER CARRIER. (Face South.)

While by the Horse's head the Water-Pourer
Spreads his right hand.

Our next star-picture is not very bright in stars but it is, nevertheless, very interesting, for it represents an old man pouring water down the sky from a huge jar, but you must have a very vivid imagination to make out his figure. However, it is quite easy to imagine that the little clusters of stars that dot this portion of the sky represent a cascade of water falling down the sky, the drops here and there catching the brilliant gleam of the moonlight.

An imaginary line drawn from Beta to Alpha Pegasi, extended its length, ends just to the left or east of a "Y" shaped figure composed of four stars which marks the water jar. Look a little to the right of the Circlet in the Fishes and you will surely see this attractive star group.

With your opera glass look at the stars in the water jar, and then slowly trace your way down the sky, and you will see many beautiful groups of two and three stars. These represent the water falling from the up-turned jar.

. . . where his urn inclines
Rivers of light brighten the wat'ry track.

Strangely enough, the water instead of wasting away, according to the ancient notion of this picture, flows into the gaping mouth of a great fish, called Piscis Australis, the Southern Fish, that swims in the sea close to the shore where the hills in the south rise up to meet the sky. Surely this is a singular idea.

I suppose that a fish just naturally takes to water, and cannot get enough of it, so the Southern Fish does not mind this "sky blue water" at all. If he did not like it he certainly would close his mouth, so my guess is that he quite enjoys this internal bath which they say is very good for everyone.

The star-picture of Aquarius is very ancient, and the fact that it lies in the Zodiac is good proof of this, for at a very early date in the history of the race the path of the Sun among the stars was marked out and considered of great importance.

The Egyptians thought that the floods on the River Nile were caused by the Water Carrier when, at setting, he dipped his jar into the river to refill it.

The Water Carrier is best seen from August to November. As the sun is in this part of the sky from February to the middle of March, and the fact that this is a moist and inclement time of the year, makes the sun's position near the water jar appropriate and significant.

Some people have seen in the arrangement of the

Photo by Hollyer

Ganymede

Painting by George Frederick Watts

faint stars in this picture the outline of the map of South America. This is not difficult to see and I have outlined the figure on the diagram.

The star Sadal Melik lies a little below the equator of the heavens. You probably know of the imaginary line known as the earth's equator; just so we have its counterpart in the sky, and the sky is mapped out much as the earth is, in order that we may know the exact position of the heavenly bodies.

Sadal Melik is an Arab star name meaning "the fortunate star of the King." The star name Sadal Suud means "the luckiest of the lucky," so if you wish to know some particularly favored stars (and who does not?), these stars are very good ones to choose. Even if they are not very bright they make up in good fortune what they lack in brilliance, and it is a true saying that "all that glitters is not gold."

According to an old Greek story, Aquarius represents Ganymede, who was appointed cup bearer to the gods. He was said to be a very beautiful boy, and was cup bearer to his father the King of Troy. The great god Jupiter took a fancy to him, and one day as Ganymede was guarding his father's flocks on Mount Ida, was taken up to the sky, and became cup bearer to the gods.

The ancient Norsemen thought that this part of the sky was Wali's palace, and that it was covered with silver, but by most of the nations of the old world this was the watery region of the sky called "the sea," in which we find many of the sea creatures traced out in the stars.

PISCIS AUSTRALIS
THE SOUTHERN FISH

PISCIS AUSTRALIS—THE SOUTHERN FISH.

(Face South.)

> Next swims the Southern Fish which bears a name
> From the South wind.
>
> MANILIUS.

As you have been facing this part of the sky and studying Aquarius you have no doubt noticed the bright star low down and almost directly below the water jar, and wondered what its name was.

This star bears the strange name of Fomalhaut, pronounced fō′-mal-ō, which means "the Fish's mouth," and on the old charts of the star-pictures the star occupies this position.

Many people who love the stars link Fomalhaut and Capella together in their thoughts as they rise almost at the same time of night in different parts of the sky. Of course Capella is much the brighter of the two, being fifth in the list of the brightest stars in the sky, while Fomalhaut is eighteenth, but Fomalhaut is in a region of the sky in which there are few bright stars and thus seems brighter than it really is.

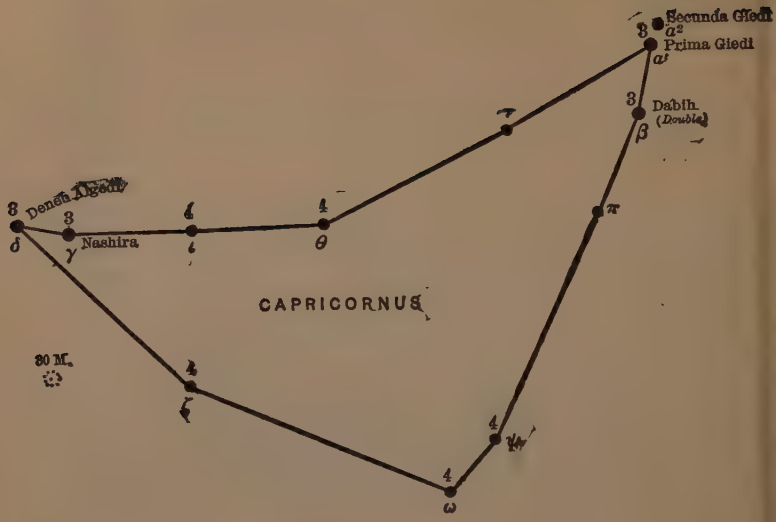
Fomalhaut is the farthest south of all the bright stars that are to be seen from our northern states. It was known to the Persians three thousand years before the birth of Christ, and was the object of sun-

rise worship in the temple of Demeter at Eleusis in Greece. This star is the second one of the four Royal stars known to the ancients. It was a star that portended eminence, fortune, and power, and astronomers inform us that it is twenty-four light-years away from us.

Mythology tells us that this star-picture took its name from the transformation that took place when Venus, terrified at the approach of the horrible monster Typhon, changed herself into a Fish in order to escape from him.

On a very clear night if you can see well down to the southern horizon you can trace out the faint stars that form the figure of the Fish. The figure is seen to good advantage at eight o'clock, November 8th.

CAPRICORNUS
THE SEA GOAT



CAPRICORNUS

CAPRICORNUS (kap-ri-kôr'-nus)—THE SEA GOAT. (Face Southwest.)

. . . the Goat
Dim in the midst, but four fair stars surround him,
One pair set close, the other wider parted.

ARATOS.

THE star-picture of Capricornus, the Sea Goat, is to be seen in the early evenings of mid-autumn low down in the southwestern sky. At eight o'clock, October 1st, it lies almost directly below the Dolphin, in the Zodiac, and to the right or west of Aquarius.

An imaginary line drawn from the star alpha in Andromeda to alpha in Pegasus, extended a little over twice its length, points to a pair of fairly bright stars located in the head of the Sea Goat.

The figure does not look the least bit like a goat but does resemble a cocked hat resting on its crown. Most of the stars in the picture are faint and it takes a clear night when the moon is not in the sky to trace out all the stars in the picture.

The sun appears to move among these stars from January 18th to February 14th. As the poet Dante expressed it:

The horn of the celestial goat doth touch the sun.

The authorities tell us that this is one of the oldest of the star-pictures, and its form has never been changed. Nowadays we prize highly everything that bears the mark of age, and yet how few realize that the most ancient stories of all are inscribed in the stars, and graven deep on the enduring scroll of the night sky for all people to read for all time.

The pair of stars known as Prima and Secunda Giedi in the Goat's head are prominent and they help us to locate the picture.

Dabih is an Arab star name having the strange meaning, "the Lucky One of the Slaughterers." Nashira, means "the Fortunate One," or "the Bringer of Good Tidings." These stars like those in Aquarius all seem to be lucky ones, and Capricornus of all the star-pictures was the favorite of the astrologers, those wise men of old who used to observe the stars in order to forecast the future. In an old almanac of 1386 we read: "Whoso is born in Capcorn schal be ryche and wel lufyd." Those born between the dates December 21st and January 20th are born under this sign and according to the stars destined to be fortunate.

Look at the star Dabih with your opera glass, and you will see that it is a charming double star, the colors of the two stars being yellow and blue. Those who love the vari-colored flowers will find in the garden of the star flowers many fascinating blooms to delight them, and although these lack the fragrance of the earth flowers, they never fade and grow closer to our hearts as the years advance.

It is an interesting fact to remember while we are tracing out the stars in Capricornus, that the planet Neptune, the most distant of the sun's family, was discovered in the year 1846 not far from the star Deneb Algedi, or Delta Capricorni as astronomers would call it. This was a most extraordinary and interesting discovery, and you will find the story of it in the chapter on the Planets.

Capricornus is said to have been named by the Chaldeans who lived in the far east many many years ago. It was called "the Goat" because that animal is always climbing up the mountain side in search of food. The sun when it reaches this star-picture appears to mount the sky and thus imitates the action of the goat, so you see the picture is really very well named.

On the old maps that show us the star-pictures, the Goat is represented as having the tail of a fish. This may mean that the picture was intended to indicate the sort of weather that would prevail at the time of the year when the sun appeared to pursue its course in this region of the sky, for in the autumn we generally have a rainy spell before winter sets in.

Capricornus has been known as "the Southern Gate of the Sun," and "the Gate of the Gods." It was thought that when men died their souls passed through these stars to the golden land of the hereafter. Bearing this in mind, this region of the sky, in spite of the fact that it contains few bright stars, was highly regarded by the people of olden times

which makes the picture of greater interest to us.

In mythology, the Sea-Goat is said to represent the god Pan, or Bacchus. It is related that one day this god was feasting with some other gods near the banks of the river Nile, when suddenly the hideous monster Typhon appeared. He seems to have made it his business to take the joy out of life, an unenviable reputation, to say the least.

To escape from this terrifying creature the gods had to think quickly, and they instantly changed themselves into different shapes. Pan leaped into the river, and the part of him that was under water resembled a fish, while the part above water was like a goat. Typhon must have been greatly surprised when he arrived on the scene to see nothing but a group of peaceful animals instead of the gods whom he had intended to slay. Jupiter was so much pleased at the quick wit of the gods that he placed Pan among the stars in the form of a Sea Goat.

According to another story, the father of the gods gave one of the Goat's horns to the nymphs who had nursed the infant Jupiter as a reward for their faithful service. The horn was a magic horn, and known as "the horn of plenty," and whoever possessed it could have anything he wished for which made it a priceless possession. You recall that this horn of plenty figured in the story about the star-picture of Auriga. In that case it was the goat's horn that the Charioteer holds in his arms.

The fact that the horn of plenty is associated with

this star-picture bears out the idea of prosperity and good fortune that seems to centre about this whole region of the sky, for some unknown reason, and renders it attractive to all who study the stars.

THE STAR-PICTURES OF WINTER

Map showing the principal stars visible from Lat. 40° N. at 9 o'clock, January fir

THE STAR-PICTURES OF WINTER

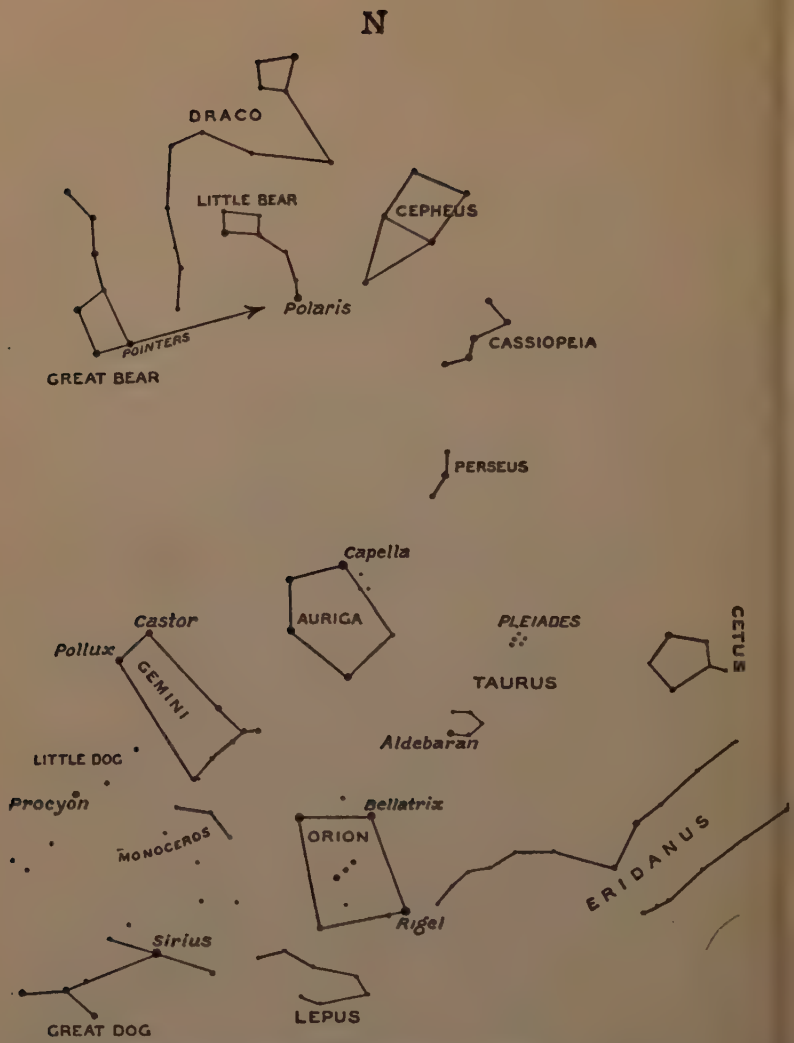
"Midwinter's suns:—when bleak and chill
The frost king reigns o'er vale and hill.
When nature sleeps as though in death
The air is still—not e'en a breath
When Earth lies ice-bound out of door
We see midwinter's stars once more.

How glorious, sublime and bright
These stars adorn yon dome of night;
Ah! how inspiring is the sight—
This threshold of the Infinite!"

It is a trifle unfortunate that the night sky of winter should be so much more attractive and beautiful than that of any other season of the year, for it is then that the cold drives us indoors to the cheer of the open fire, and the "magnificent company of the winter constellations" meet the wondering and admiring gaze of few.

However, if you bundle up well and do not stay out too long, your visit to Starland in winter will be a great source of pleasure to you, for the gallery of winter star-pictures contains many masterpieces of surpassing beauty.

It seems as if the frost-sprites had burnished up the stars on winter nights so that they shine with an



The Southern mid-winter sky in the early evening. Turn the book upside down to get a correct view of the Northern sky.

increased lustre, and flash all the colors of the rainbow to us in friendly greeting from unknown and far distant realms. The most beautiful stars in all the sky now light the heavens. Like the precious stones that the jeweler spreads before us when he sets his tray on the counter, we see on the jet background of the winter night sky the most brilliant display of star jewels imaginable.

In beginning our study of the star-pictures we will first search for those that are most important, the pictures that, because of their position in the sky, we can see all the year round. To do this you must face the northern sky.

Perhaps you do not know which way north is. If you have a compass the needle will inform you at once of the proper direction, but if not, you have only to recall that the sun appears to rise in the east. Stand with your right hand pointing east and you will be facing north. Locate the north point of the sky in the daytime, and then you will be able to follow the directions for locating the star-pictures.

Turn to the map of the mid-winter sky, and hold the book upside down. You now have before you the correct view of the stars in the northern sky, as it appears in the early evening at this time of the year.

Mother Earth, like a whirling dervish, is constantly spinning about, making one complete turn each day. This motion causes the star-pictures in the sky to appear to circle about Polaris, the North Star, and the five star-pictures, of the Great and

Little Bear, Draco, the Dragon, Cepheus, and Cassiopeia which are not far from Polaris, can be seen at any time of the year as they turn about the North Star. In turning they assume a variety of positions, and we must study them closely in order to be able to recognize them wherever they may happen to be.

Facing north you will see seven fairly bright stars that form a figure resembling a dipper balanced on the tip of its crooked handle. This is the famous star-picture known as the "Big Dipper" or "Great Bear." The handle of the Dipper is the tail of the Bear. For a full description of this picture turn to the chapter of the book describing the autumn stars.

From the two uppermost stars in the Dipper you will notice on the map that an arrow points in the direction of a star. This star is Polaris, the North Star, probably the best known, and the greatest aid to man of all the stars.

Whichever way the Dipper appears in the sky, an imaginary line drawn through these two stars, as the arrow indicates, and extended, always points to Polaris. With this knowledge you can always find your way if you should be lost at night.

Swinging off below and to the right of Polaris, you will see the star-picture of the "Little Bear" or "Little Dipper." The stars in this picture are for the most part faint, and you can only see all of the seven stars on a clear night when the moon is not in the sky.

The two stars that are nearest the tail of the Great

Bear and farthest from Polaris are the brightest, and are called "the Guardians of the Pole."

For a description of this and the other star-pictures in the northern sky turn to the chapter on the autumn star-pictures.

Draco, the Dragon, curls about between the Bears. To the left of Polaris, and the same distance from it as the Great Bear, you will see an "M" shaped figure composed of five stars that are fairly bright. This is the star-picture of Cassiopeia, or the Lady in the Chair. Between this picture and the Dragon lies the picture of Cepheus, the king, composed of faint stars, but if you have a clear night you can trace out the stars which form a figure which resembles a house with a peaked roof.

You will find all the names of the stars in these pictures on the map of the autumn night sky. The map of the winter night sky will show you exactly where each of the pictures mentioned above is located.

ORION
THE GIANT HUNTER

Alhena
in
Gemini
1 Aldebaran
Taurus
ξ
τ
μ
3
Meissa
λ
1
Betelgeuze
α
2
Bellatrix
γ
The
Lion's
Skin
ORION
4
2
2
Mintaka
δ
2
Alnitak
ζ
2
Alnilam
ε
σ
η
θ
Gt.
Neb.
Eridanus
3
Saiph
1
Rigel
β

ORION

ORION (ō-rī′-on)—THE GIANT HUNTER.

(Face South.)

Behold Orion rise,
His arms extended measures half the skies;
His stride no less. Onward with steady face
He treads the boundless realms of starry space,
On each broad shoulder a bright gem displayed
While three obliquely grace his mighty blade.

MANILIUS.

THERE is nothing of all that the naked eye beholds in the starry skies that equals in splendor and beauty the sight of the star-picture of Orion, the Giant Hunter, as he tops the snow-mantled eastern hills on a winter night, and strides majestically across the southern skies.

This glorious star-picture because of its beauty and celebrity is the first of the winter night star-pictures to claim our attention. Unlike many of the star-pictures it is easy to locate on account of its many bright stars.

To see the picture to best advantage we must face directly south in the early evening on some clear mid-winter night. Half way up the sky you will see the three "Belt stars" about equal in brightness to Polaris, arranged like steps that lead up the sky from east to west.

A glance at the map will show you how they appear in the sky, and their place in the Giant's belt. You will note at once that these stars are enclosed in a four-sided figure, three of the corners of the figure being marked by brilliant stars.

The Giant is represented on the old maps of the heavens as holding a lion's skin before him as a shield. In his right hand is a club raised high, threatening to strike the Bull that is charging down upon him. Aldebaran, the bright red star in the Bull's eye, you will see above Orion and to the right.

Thus graced and armed he leads the starry host.

Faint stars mark the club and lion's skin, but the night must be clear to enable you to see them.

Always see to it when you are observing the stars, that there are no artificial lights near by to dazzle your eyes. Use an electric pocket flash light to illuminate the pages of your book, and it is a good plan to enclose the bulb with red tissue paper held in place by a rubber band, for red light is restful to the eye.

After you have studied the figure of Orion in the book you can, with a little stretch of the imagination, see the Giant in the sky, and when at last you have this dramatic stellar picture before your eyes you thrill with emotion at the thought of the myriads of people who have gazed with awe and reverence at this sublime spectacle. The mystery enshrouding the significance of the figure, its tremendous and imposing proportions, its celebrity through all the ages

from the remote past, these are the thoughts that awaken our souls to the eternal beauty and exalted significance of the stars.

Orion rises in the early evening about December 1st, and sets in the western sky the middle of April. No other star-picture contains as many bright stars as Orion and all winter long, whenever we gaze upward at the stars, we feel the might and presence of the Giant Hunter of the sky.

The poets of all lands and in all times have sung the praises of this starry Giant. Manilius wrote:

> Orion's beams, Orion's beams;
> His star-gemmed belt and shining blade
> His isles of light, his silver streams,
> And glowing gulfs of mystic shade.

Our great poet Longfellow thus refers to the Giant Hunter:

> Begirt with many a blazing star
> Stood the great giant Algebar
> Orion, hunter of the beast,
> His sword hung gleaming by his side.

We will now learn the names of the beautiful stars that form the famous picture.

> . . . First in rank,
> The Martial star upon the shoulder flames.

The name of the orange-colored star in the upper left-hand corner of the four-sided figure enclosing the

Belt stars, is Betelgeuse* (pronounced Bet-el-gerz'), an Arab name meaning "the armpit of the Central One." It is the second in brightness of the three bright stars in the sky that are red in color. It marks the right shoulder of the Giant, and is the first bright star in the picture to appear in the east in the early evening late in the autumn, a starry herald announcing the approach of the Giant Hunter.

Betelgeuse is an irregular variable star, that is, it does not always shine with the same brilliance. Astronomers do not know why it changes its light nor when it will do so. It is traveling away from us at the rate of ten and one half miles a second.

The brightest star in the picture, and one of the most attractive stars in the sky, marks the lower right-hand corner of the four-sided figure, a flashing white sun called "Rigel." It is beautiful in name and color, and is seventh in order of brightness of all the stars in the sky. It marks the left foot of the Giant Hunter.

* An interesting fact has lately been revealed concerning the star Betelgeuse. On the night of Dec. 13, 1920, Mr. Francis G. Pease, and Dr. J. A. Anderson using the great 100 inch reflecting telescope at the Mt. Wilson Observatory, equipped with an interferometer, and a method suggested by its inventor, Professor A. A. Michelson, succeeded in measuring the diameter of Betelgeuse. The first time that a star's diameter had been actually measured. Betelgeuse proved to be a giant star approximately 273,000,000 miles in diameter. The circumference of the star would be nearly equal to that of the orbit of the planet Mars, and if it were as near to us as our sun, it would cover the entire sky. The fact that Betelgeuse is red in color and a giant in size shows that it is a youthful star in point of age among the stellar hosts, and well named the "Martial star."

Rigel is an enormous distance away from us, and speeding from us at the rate of fifteen miles a second. When we are in an automobile traveling at the rate of forty miles an hour, we think we are going pretty fast, but an auto that kept up with Rigel would have to go at a speed of fifty-four thousand miles an hour, the thought of which fairly takes our breath away. According to Professor Newcomb, Rigel is at least ten thousand times brighter than our sun which is of such dazzling brightness that we cannot gaze directly at it without protecting our eyes. Think of the glory and radiance surrounding Rigel!

Bellatrix is the name of the star in the Giant's left shoulder. It has been known as "the Female Warrior," and the "Amazon Star." The Amazon River Indians thought that this star was a small boy in a canoe, with an old man represented by the star Betelgeuse. They imagined that they were chasing the Peixie Boi, a dark spot in the sky near Orion, the exact location of which they do not disclose.

The three stars in the Belt, because of their striking position in the sky have attracted universal attention since the dawn of history. They all bear Arab star names. The upper one is called "Mintaka," meaning "the Belt," the middle one is "Alnilam," the "string of pearls," and the name of the lower one is "Alnitak," meaning "the girdle."

A line drawn through these stars projected up the sky points to the red star Aldebaran, in the eye of

the Bull, the line extended downward guides you to the glorious star Sirius, in the Great Dog, the brightest star in the sky.

Some authorities think that these three stars are the Bands of Orion mentioned in the Bible. The Arabs called them "the golden nuts," or "the string of pearls." One tribe of Africans called them "the three pigs," and among the Hindus they were known as "the three jointed arrow." The Chinese knew them as a "weighing beam," the Eskimos thought that they represented the three steps cut in a snow-bank by an Eskimo to help him reach the top. The Greenlanders imagined that they were three seal hunters lost at sea, and placed in the sky. However, the best known names for these famous stars are "the three Kings," the "Ell," and "the Yard."

The star above and about half way between Betelgeuse and Bellatrix is called "Meissa," which means "the Head of the Giant."

Just below Alnitak is a faint star known as Sigma, σ, Orionis. It is an exquisite multiple star, that is, instead of being one star as it appears to the naked eye, a telescope reveals eight or ten stars, many of them beautifully colored. The sight of these stars is entrancing, and if you have a telescope or an opportunity of using one be sure to take a look at this wonderfully interesting star.

With your opera glass look closely at the star Theta, θ, just below the Belt stars. The poet Tennyson thus refers to it:

. . . a single misty star
Which is the second in a line of stars
That seem a sword beneath a belt of three.

This star represents the sword that the Giant carries, and the glass reveals a mist or fog that seems to completely surround it and makes it a hazy object to view quite unlike the appearance of the other stars. The telescopic view of this star reveals a wonderful sight. It is a great nebula, an irregular shaped cloud of glowing gas, that we know to be in rapid motion. This nebula is the most wonderful object of its kind in the sky. Professor Barnard says that it looks like a ghostly bat flitting through the night of space. It is thought that these clouds of gas produce suns like ours surrounded by planets like our earth, so that here we behold the mint that turns out the golden coins men call stars, and sets them in the night's vast treasure house.

The nebula is so far away from us that it is useless for us to even think how far distant it is.

Orion is described by Homer as "the tallest and most beautiful of men." It is said that he claimed that there was not a creature on earth that he could not conquer, which was a foolish thing to say. The gods who were thought to rule the affairs of mankind in ancient times were displeased at Orion because of his conceit, and resolved to teach him a lesson. They caused a scorpion to rise from the ground which bit the foot of the Giant, causing his death. At Diana's request he was placed among the stars, and the scorpion also, but in order that Orion might

never again suffer such a death, they were placed opposite each other in the sky, and we never see them among the stars at the same time.

When the Scorpion comes,
Orion flees to utmost end of earth.

According to another story, the Giant Hunter fell in love with Merope, the beautiful daughter of the king of Chios. Her father did not approve of Orion, and the Hunter very foolishly attempted to carry Merope away with him, but her father caught him in the act and was so angry with Orion that he put out his eyes and left the poor man alone upon the seashore. Hearing the sound of hammering, the blind Giant groped his way to the forge of Vulcan, and begged assistance. Vulcan's heart was touched at the pitiful sight, and he had one of his assistants, who was also a giant with one great eye in the centre of his head, called a Cyclops, carry Orion to the top of a mountain. There the Hunter faced eastward and the first beams of the rising sun on his eyes restored his sight.

The Giant Hunter, in spite of his size and far-famed beauty seemed to be always getting into trouble. One of the old stories relates that the Moon Goddess, Diana, fell in love with Orion. Apollo, the Sun God, her twin brother, did not fancy the Hunter, and to prevent his sister from marrying him poured his golden rays on Orion one day when he was bathing, then he requested Diana to test her skill in archery by shooting at the shining mark.

Diana, not dreaming that the brightness concealed her lover, drew her bow and her arrow went true to the mark and killed Orion. In her grief she besought Jove for aid, and pitying her he placed Orion among the stars. Now as the Moon Goddess sails across the sky in her beautiful silver boat, and reaches her lover in the stars, she gazes fondly upon him, and doubtless when a cloud prevents us from seeing her, she kisses him.

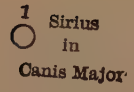
Because of its position in the sky, Orion was dreaded by the daring sailors who sailed the seas in ancient times:

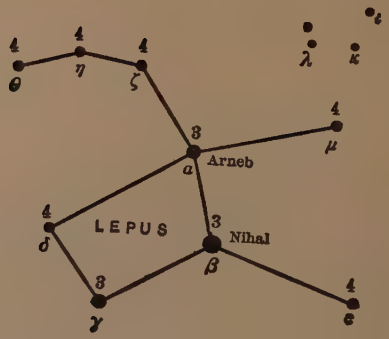
> When the fierce winds Orion arrived
> Hath vexed the Red Sea coast.

It is said that in one of the early wars, a great Roman fleet was destroyed because it set sail between the risings of Orion and Sirius.

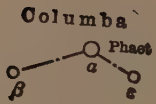
There is still a vast deal to be told about this beautiful star-picture, but there is not room for more now. You must get other books about the stars, and as you read of their wonderful and fascinating history, you will learn to love them, and whenever you behold them they will send you beams of friendly welcome, full of mystery and charm, all your life long.

LEPUS
THE HARE





Eridanus



LEPUS

LEPUS (lē′-pus)—THE HARE. (Face South.)

Under Orion's feet, mark too the Hare,
Perpetually pursued. Behind him Sirius
Drives as in chase, hard pressing when he rises,
And when he sinks as hotly pressing still.

FROTHINGHAM'S ARATOS.

BELOW the Giant Hunter is the star-picture of the Hare. Its stars are faint and rather fit the picture, for the hare is a timid creature by nature.

A little group of four faint stars mark the ears of the Hare, and if you look carefully at the picture of the creature in the book, you should be able to trace out the figure of the Hare in the sky.

The back, one eye, and three of the Hare's paws are marked by stars. The figure lies just below a line connecting the stars Rigel and Saiph in Orion. About February 8th or mid-winter is the best time to view this star-picture in the early evening, but you need a clear night to see all its stars.

The curving line of three stars that mark the back of the Hare point toward the flaming Sirius, in the star-picture of the Great Dog. Those who sketched the star-pictures in the sky evidently intended to represent here a hunting scene, the Dog pursuing the

Hare and the Hare appears to be crouching low close to Orion as if seeking his protection.

The star γ Gamma Leporis is a double star which you may be able to see as a double in your opera or field glass. There are thousands of these beautiful objects in the sky, and the contrasting colors of the twin stars is a source of pleasure and delight to all who behold them. It is a pity that more people do not search the skies for the wonderful treasures hidden there. People who will go miles in search of a rare orchid never think of gazing at the glories of the heavens.

Draw an imaginary line from the star Alpha to μ Mu and extend it about one third of its length. In this region search for an unusually red star. This is called "Hind's crimson star," and it has been likened to "a drop of blood on a black field." Its light varies for some unknown reason, so that it is only when it is brightest that it is visible in a field glass, so do not be disappointed if you do not see it, but look for it some other time.

The Arabs thought that the four-sided figure outlined in the diagram were four camels drinking from the River in the sky, which we will read about in a later chapter.

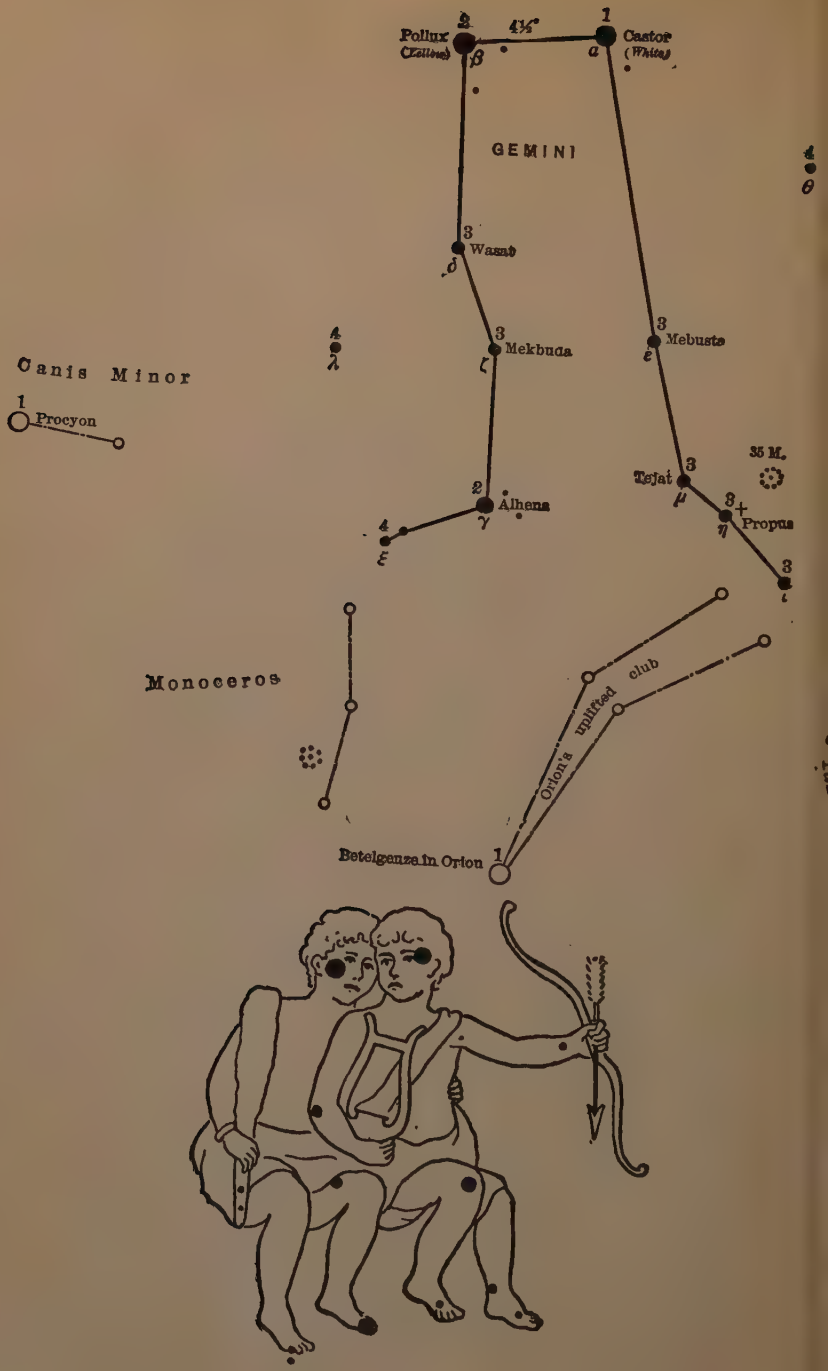
There was a strange belief among people in the olden times that the Hare disliked above all else the cry of the Raven or Crow, and we find the star-pictures of these creatures so arranged in the sky, that the Hare sets in the west when the Crow rises in the east; thus there is no chance for the Hare to be

disturbed by the crow's presence, even among the star-pictures.

The Chinese imagined that there is a Hare in the Moon, which is forever making rice cakes, and that a three-legged crow lives in the Sun. We know that the moonlight fades in the presence of the more resplendent sun, and possibly this is why the Hare hates the Crow.

It is said that the Giant Hunter delighted in hunting hares, and thus one was placed near him in the sky; but, as we have seen, he appears to be too much interested in defending himself from the charge of the Bull to pay attention to such small game as a hare.

GEMINI
THE TWINS


Pollux
(Yellow)
β
2
4½°
1
Castor
(White)
α
GEMINI
3
Wasat
δ
3
Mebusta
ε
4
λ
3
Mekbuda
ζ
Canis Minor
1
Procyon
2
Alhena
γ
4
ε
3
Tejat
μ
35 M.
3+
Propus
η
3
ι
Monoceros
Orion's uplifted club
Betelgeuze in Orion
1

GEMINI (jem'-i-ni)—THE TWINS. (Face East.)

> Tender Gemini in strict embrace
> Stand clos'd and smiling in each other's Face;
> MANILIUS.

A GLANCE at the map of the winter stars will show you where to look for the Twins in the sky. An imaginary line drawn from Rigel to Betelgeuse in Orion, extended, points to the two bright stars Castor and Pollux in Gemini that mark the heads of the Twins.

Gemini is well placed for observation in the early evening about January 1st, in the east, and about June 1st in the western sky.

The star-picture of the Twins is in the Zodiac, which is the name of the path that extends all the way around the sky, and over which the sun, moon, and planets take their encircling way. It is divided into twelve equal parts, each of which is marked by a star-picture. These pictures are probably the oldest of all that have come down to us, and for this reason there is a wealth of history surrounding them that makes them especially interesting to those who study the stars.

The two bright stars Castor and Pollux have been

called "the Twins" from the earliest times, but they have also received other names, such as the "Two Peacocks," the "Two Kids," and the "Giant's Eyes." Pollux is now the brighter of the two stars, but in olden times Castor was the more brilliant of the two, which, for some reason that is not clear, has lost a part of its original brightness.

Castor is a beautiful double star in a small telescope. The famous astronomer, Sir John Herschel, called it "the largest and finest double star in the northern skies."

With your opera glass look for the beautiful star cluster marked 35 M. which even in a small telescope is a magnificent object. As we have said before the letter "M" after the number is the initial letter of the astronomer Messier, who discovered many star clusters and catalogued them. This cluster has been described as "a marvelously striking object, and no one can see it for the first time without an exclamation."

According to an old story, Castor and Pollux were twin brothers, the sons of Jupiter and Leda. From early youth they led active and venturesome lives, and were inseparable companions.

They were of the company of Argonauts who went with Jason on the perilous adventure to recover the golden fleece at Colchis, and on this occasion displayed great courage and bravery.

Castor excelled in the management of horses, while Pollux was famous as a soldier and boxer. As the poet Martial expresses it:

Castor alert to tame the foaming steed,
And Pollux strong to deal the manly deed.

The figures of the Twins appeared in the old Greek temples on horseback, armed with spears, and riding side by side, and the Romans, when they were engaged in battle with their enemies, imagined that Castor and Pollux appeared and led them as they charged the foe.

The Twins were greatly admired by all who sailed the seas, for they were said to have attacked and broken up the pirate bands that used to make it unsafe for ships to sail the Hellespont, and the neighboring seas.

It is related that when Castor and Pollux were on the Argonautic expedition, a great storm arose, and, at the height of it, two flames appeared above the heads of the Twins, and immediately the storm ceased.

In honor of the Twins, these lights were known as "Ledean lights," or "St. Elmo's lamps."

The death of the Twins came about in this way. They were invited to the wedding of two young men named Lynceus and Idas, who were to marry Phœbe and Telaria, the daughters of Leucippus. It appears that Castor and Pollux fell in love with the beautiful brides-to-be, at first sight, and resolved to marry them. This plan of theirs did not add to the solemnity and peace of the occasion, as you can well imagine, and the wedding resolved itself into a disgraceful fight.

Castor attacked and killed Lynceus, but Idas,

rushing to aid his brother, slew Castor. Pollux then took a hand, and killed Idas, and of the four was the sole survivor.

Pollux, grief stricken at the death of his brother, implored the gods to restore Castor to life, or else take from himself the immortality they had granted him. Jupiter thought so much of the Twins, that he decided that Pollux should share his immortality with Castor, so that as long as one lived, just so long the other remained dead. According to this plan one of the Twins always lived. Later on, Jupiter further rewarded the Twins by placing them among the stars close to each other.

The following interesting story accounts for the name "Giant Eyes" that was given to this star-picture by some of the people of the ancient world:

Once upon a time, there lived a great magician named Daze. He was a giant in size, and could change himself whenever he wished into any sort of creature.

One day he took the form of an eagle, and looking down from the sky, he saw three gods sitting around a camp fire cooking an ox in a huge pot.

Daze said to himself, "here is a perfectly good dinner for me," so he flew down and perched on a tree near the fire.

He then cast a magic spell over the pot, which prevented the meat from cooking. The gods kept piling on wood, and the water in the pot boiled and sputtered but the meat did not cook at all, which made the hungry gods very angry.

"What will you give if I will make the meat cook?" said Daze from the tree. The gods talked it over, and offered Daze a share of the meat if he could make it cook. Daze was satisfied with this arrangement and removed the spell so that the meat was soon cooked and ready to eat.

Loke, one of the gods, lifted the meat out of the pot, but no sooner had he done so when down flew Daze, and grabbed the best part of the meat in his claws, leaving only the bones for the gods.

Loke was very angry at this and struck Daze a terrible blow with a pole, but Daze expected this and the pole simply stuck to his back, and Loke found that he could not let go of the pole, for Daze had cast a spell over him.

Off flew Daze with the meat in his claws, and the pole with Loke clinging to it on his back. Because of his burden, Daze flew pretty low and poor Loke was bumped about by the trees and rocks they passed, so that when Daze ordered him to procure for him the apples of Youth he was only too glad to agree to make the attempt.

The apples of Youth were priceless, for anyone who ate them never grew old, and they were well guarded, but in spite of all obstacles Loke succeeded in obtaining them and turned them over to Daze.

The guardians of the treasured apples were furious at the loss of the precious fruit, and threatened Loke's life if he did not get them back from Daze.

Loke changed himself into a bird, and flew off to Daze's home. Luckily Daze was out fishing, and Loke

seeing the precious apples on the table, grabbed them up in his claws and flew off with them.

When Daze returned home, he was in a terrible rage over his loss, and changing himself into an eagle set out after Loke.

The eagle being such a powerful bird, gained rapidly on Loke, but Loke was almost home and all the gods were up on the city wall to welcome him. Seeing Daze close behind him, they built a huge fire on the wall which they lit as soon as Loke had crossed the wall, and Daze who was close behind him was caught in the flames, and his feathers were all burnt off. Down he tumbled to the ground where the gods killed him, but his eyes were placed in the sky, and we see them on winter's nights looking down at us in the star-picture of the Twins.

The natives of Australia imagined that Castor and Pollux were two huntsmen named Yurree and Wanjil. They are out hunting Purra, the kangaroo, represented by the brilliant star Capella, in the star-picture of Auriga, to the west and north of Gemini. At the season of the great heat, the hunters finally catch up with the kangaroo and kill him. They then cook his meat over a fire, and the smoke of this fire is the shimmering haze rising from the hot fields in summer that we call a mirage.

MONOCEROS
THE UNICORN

Alhena
in
Gemini
ξ
Cancer
β
Procyon
in
Canis Minor
Betelgeuse
in
Orion
MONOCEROS
50 M.
46 M.
Sirius
in
Canis Major

MONOCEROS

MONOCEROS (mō nos'-e-ros)—THE UNICORN.

(Face South.)

WHILE we are in the region of the sky occupied by the star-pictures of Orion and Gemini we may as well locate the picture of a strange-looking animal that roams in Starland.

In the picture we see that the creature resembles a horse with a long horn sticking out of his forehead. This fierce looking animal is well guarded by the Giant Hunter and his two Dogs, as you will see by looking at the Diagram.

The stars in the picture are all faint, but on a clear night you will easily see the stars forming the head of the beast, just to the left or east of the star Betelgeuse in Orion.

Monoceros is a comparatively new star-picture. The people of ages past who first painted the star-pictures on the sky were naturally attracted by the brighter stars, and used these up first to trace out figures in the sky. This left a great many faint stars in the sky that were not included in any picture. From time to time it occurred to some one to form these faint stars into pictures, and although they are not as attractive to look at as the brighter and better-known figures, still it is great fun to hunt for them,

just as it is entertaining to work out a puzzle. You should not be contented until you know all the star-pictures.

There are a number of beautiful star clusters in Monoceros, and you should sweep over this region with your opera glass, for it reveals many charming objects.

The Monoceros is said to be a species of the Unicorn or Rhinoceros. It is claimed that when pursued, it leaps from great heights and lands upon its horn which breaks its fall, and it runs on uninjured.

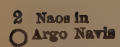
CANIS MAJOR
THE GREAT DOG

50 M.
Muliphen
4
Var.
γ
1
Sirius
α
2
Mursim
β
v
41 M.
3
o
CANIS
MAJOR
3
Wesen
δ
22
2
Adara
ε
3
Aludra
η
3
Furud
ζ
4
μ

Sciph
in
Orion

Lepus

Phaet
Colum


2 Naos in
Argo Navis

CANIS MAJOR

CANIS MAJOR (kā′-nis mā-jor)—THE GREAT DOG. (Face South.)

All others he excells; no fairer light
Ascends the skies, none set so clear and bright.
MANILIUS.

THERE is no difficulty in locating the beautiful star-picture of Canis Major, the Great Dog, as Sirius its brightest star outshines all the other stars in the sky, and its glorious beams attract the attention of everyone who raises his eyes to the stars on winter nights.

The Great Dog is to be seen to the left or east of Lepus, the Hare, and contains a number of bright stars. The three stars in Orion's belt point downward to Sirius.

From the earliest times Sirius has been known as "the Dog of Orion," and the star has been famous since the dawn of history.

Sirius rises in the early evening about Christmas time, by March 1st it shines directly south, and it is lost to our view in the west the middle of May.

The sight of this brilliant star in a telescope is most entrancing. Bright rays of every hue dart from its flaming heart. As the poet Tennyson expresses it:

The fiery Sirius alters hue,
And bickers into red and emerald.

Sirius was a favorite star with the Egyptians who worshipped this sun. With them it performed a great service as its appearance in the east warned them of the rising of the River Nile each year; thus the people who lived near the bank of the river could pack up their things, and move them to a safe place out of reach of the waters.

The service this star rendered the Egyptians was like that of a dog who barks and warns his master when some one approaches so that the master can prepare himself. This may be the reason why this star-picture was called "the Dog," for of course it does not resemble a dog.

The poet Aratos thus describes Sirius:

In his fell jaw
Flames a star above all others with searing beams
Fiercely burning, called by mortals Sirius.

Many of the Egyptian temples were built in honor of this "King of Suns." One of these was the famous temple of Isis at Denderah. Here Sirius was known as "Her Majesty of Denderah," and the light of the star as it rose penetrated down a long dark passage-way till it shone upon the altar in the inner temple. What a wonderful sight that must have been as the silvery beam of star-light suddenly darted like an arrow straight to its mark, and lingered for a moment in the full view of the multitude of worshippers.

Truly that must have been a marvelous sight, full of mystery and wonder.

You have probably heard of the hot and humid days in summer that people call "Dog-days." These days get their name from the fact that Sirius is overhead in the daytime at this season of the year, and men thought that the rays from this bright star added to the warmth of the sunshine, and this made the weather unusually hot. We know now that Sirius is a great distance from us and that the heat from it is too little to cause any such effect.

Sirius is the nearest to us of all the bright stars, but it is so far away that it takes its light over eight years to reach us, and light travels at the tremendous speed of 186,000 miles a second.

The Finnish poet Topelius fancied that two stars fell in love with each other, and when they embraced, a new star was born, the brilliant Sirius.

> Straight rushed into each other's arms
> And melted into one.
> So they became the brightest star
> In heaven's high arch and dwelt
> Great Sirius, the mighty sun,
> Beneath Orion's belt.

Sometimes there is a truth hidden in a fairy story, or a poetic fancy, and, in this case, the telescope reveals that Sirius has a companion star hidden in its rays. The story of the discovery of this star is most interesting, and worth remembering.

The celebrated astronomer, Bessel, after observing

it closely for ten years, announced that the motion of the star which he was able to measure indicated that there was an invisible star revolving about Sirius. On January 31, 1862, Alvan G. Clark, of Cambridge, Mass., a noted maker of telescopes, tested a glass he had made by observing Sirius, and lo and behold! there was a tiny star twinkling away bravely in spite of the radiance streaming from the brilliant Sirius, thus confirming Bessel's wonderful prediction.

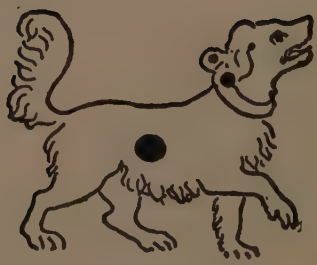
Canis Major, according to the old stories, was one of Orion's hunting dogs, placed with him in the sky.

Another story relates that this is the dog Aurora gave Cephalos. It was said to surpass all other dogs in fleetness. Cephalos thought he would prove this by racing his dog against a fox, which you know is very swift of foot. The dog and the fox raced for a time without either gaining the advantage, and Jupiter was so pleased with the dog's fleetness, that he placed him in the sky as a reward.

There is a great deal more that could be told about this beautiful star-picture, which has been so admired by all men, but we must pass on to view some of the other pictures that brighten up the night skies of winter.

CANIS MINOR
THE LITTLE DOG

The Head of Hydra
Cancer
β
2
Pollux
Cas
Gemini
3
4
γ
1
Procyon
3
α
Gomeisa
β
CANIS MINOR
Monoceros
Betelgeuze
in
Orion
1



CANIS MINOR

CANIS MINOR (Kā′-nis mī′-nor)—THE LITTLE DOG. (Face Southeast.)

The dog's precursor, too, shines bright beneath the Twins.
ARATOS.

A GLANCE at the diagram will show you at once where to look for the star-picture of Canis Minor, the Little Dog. It contains only two naked-eye stars of any importance, the brighter of the two, Procyon by name, a beautiful yellow star, rises a little north of east at 8 P.M. the middle of December, and from then until June 1st it is well placed for observation. In the early evening, in mid-winter, it is to be seen in the southeastern sky.

Procyon is located a little to the left, that is, east of an imaginary line drawn from Sirius to Pollux, and about midway between these two stars.

The name Procyon means "before the dog," as this star heralds the appearance in the sky of the Dog star Sirius, rising about twenty minutes before it.

In ancient times the Little Dog was thought to be a water dog because it stood on the border of the Milky Way which was thought to be a river in the sky. In the old maps of the sky, the Little Dog resembles a spaniel, which, as you know, is considered a water dog.

The old stories about the Little Dog are a bit confusing, and we have quite a choice in the matter of deciding just whose dog he is. Seeing the two dogs following in the footsteps of the Giant Hunter, we might readily suppose that the Little Dog was one of Orion's hunting dogs, and many have so regarded him.

Others think, however, that this is the faithful dog named Mera, whose master Icarius had been murdered and his body had not been discovered. Erigone, his daughter, was grief-stricken at her loss, and at the failure to locate her father's body. The devoted Mera searched everywhere for his master, and finally found his body, and his barking brought Erigone to the spot. Grief, however, had crazed her, and in her despair she hung herself. The loyal Mera also pined away with grief and died, but the gods rewarded his faithfulness by placing him among the stars.

According to another story, the Little Dog represents one of the hounds of Actæon. It is related that Actæon was one day strolling through the forest when he was unfortunate enough to surprise Diana, the moon goddess, and her companons as they were bathing.

Diana, surprised and indignant at his intrusion, dashed water in his face, and immediately he was changed into a stag. While he stood there in his new form, his dogs caught sight of him, and he fled for his life, but it was in vain, for the dogs caught up with him, and dragged him down to death. Diana was

thus avenged, but it does not appear why the god saw fit to reward Actæon's hound with a place in Starland's Hall of Fame for killing his master, and I doubt if we will ever know the reason.

Now that we are acquainted with Procyon, the following facts are of interest. This star is the sixth in the order of brightness among the stars seen in this latitude, and it is the only one of the bright winter stars that is yellow in color. The light from Procyon takes 9½ years to reach us, and the star is approaching the earth at the rate of nearly six miles a second. Strangely enough Procyon, like Sirius, has a faint companion star revolving about it.

Although it is easy to state these facts, think of the time and effort that it has cost to give this knowledge to the world, and you will have a higher respect and admiration for the work of the astronomers who give of their lives and wisdom to advance our knowledge of the stars.

CETUS
THE WHALE

Aries
Menkar
Al Rischa in Pisces
CETUS
Mira - a famous variable
Baten Kaitos
Deneb
Schemali
Eridanus
Deneb Kaitos

CETUS

CETUS (se-tus)—THE WHALE. (Face Southwest.)

With gills pulmonic breathes the enormous whale.
DARWIN.

WE must now go to sea, for we are in search of a whale, and while there is no chance of our seeing him spout, still we can examine him closely without danger of being attacked.

As you will notice by a look at his photograph, he is certainly a queer-looking whale, but he is a star whale, and swims in the sky, and is naturally different from sea-going whales.

In the early evenings in November look for him in the southwestern sky. In December and January he is south of us, and in mid-winter in the southwest.

First of all look for the head of the monster. It is a little to the right or west of the Pleiades.

Always study the diagrams before you try to locate the star-pictures in the sky, for they will show you where to find the picture you are in search of.

There are five stars in the Whale's head; one of them is a fairly bright one, and this, with the other stars, forms a five-sided figure which is quite easy to see.

The remaining stars in the picture are below and

to the right or west, and if you connect them with imaginary lines, as has been done in the diagram, you will see that they form the figure of a steamer chair.

The bright star in the head of the Whale was called "Menkar" by the Arabs, which means "the nose." It is an orange-colored star, and your opera glass reveals that it has a faint companion star of a bluish tint.

The brightest star in the picture is "Deneb Kaitos," which means "the tail of the Whale." It is yellowish in color, and the first day of December, at 8 P.M., you will see it directly south, one third of the way up the sky.

You see how useful the stars are to direct our course when we are well acquainted with them. They also provide us with a perpetual calendar, and a time piece that never runs down, and never has to be wound up.

There is in this star-picture a very wonderful star. It bears the beautiful star name "Mira," which means "the wonderful." Way back in August, 1596, Dr. Fabricius, a Dutch astronomer, noticed that it was almost as bright as Polaris. By October it had disappeared from view, which means that it was fainter than the sixth magnitude. Surely that was a wonderful discovery to make! Later on it brightened up again, and then disappeared, and ever since this time these changes in the light of this star have been observed by astronomers.

Stars that change in brightness are known as

Variable stars, and they form a fascinating branch of astronomical work. We now know that it takes about three hundred and thirty days for Mira to change from a bright star to a faint one, and then back to a bright one. We do not know why its light changes, nor how bright it will be when it is brightest. It is a very interesting star to observe, and you must look at it often with your opera glass, and watch it brighten up and gradually fade away. To see it when it is faintest requires a small telescope.

The star marked τ, Tau Ceti, is one of our near star neighbors. It ranks second in nearness of all the stars that we see with the naked eye in this latitude, Sirius being first. It is almost ten light-years away. Let us see how far this star is from us in miles. It is a little example in arithmetic. Light travels at the rate of 186,000 miles a second. In order to find out how far light travels in a year, you must first multiply this figure by sixty to find how far it travels in a minute, then by sixty again to obtain its rate per hour, then by twenty-four to get its daily rate, and again by three hundred and sixty-five, and you have the number of miles light travels in one year, or one "light-year" as astronomers call it. Multiply this number by ten to find the distance that Tau Ceti is away from us and you have as a result the small matter of fifty-seven trillion, eight hundred and fifty-three billion miles. This give you a little idea of the distances that the stars are away from us. Is it not wonderful that we know anything about them?

Cetus is a very old star-picture, and probably was known to the shepherds of ancient times who traced out the star-pictures in the sky while they were watching their flocks.

The best-known story about the Whale is the one that connects it with the story of Perseus and Andromeda. You will find it told in this book by turning to the description of these star-pictures.

The beautiful Andromeda was chained to a rock on the seashore, a prey to this cruel sea monster, and just as he was about to devour the unfortunate maiden, along came the gallant hero Perseus, who slew the monster, and rescued the fair Andromeda, whom he afterwards married. The monster was turned to stone, and so rendered harmless for all time.

ERIDANUS
THE RIVER

1
Betelgeuze
Orion
Rigel
1
Saiph
Taurus
The Head of Cetus
4 Cursa
β
ψ
ω
μ
ν
λ
2
γ
δ
ε
ζ
η
ERIDANUS
The Sceptre of Brandenburg
τ
Lepus
α
β
γ
δ

ERIDANUS

ERIDANUS (ē-rid′-a-nus)—THE RIVER. (Face South.)

The scorched waters of Eridanus' tear-swollen flood
Welling beneath the left foot of Orion.

ARATOS.

YOU have probably heard of the Gulf Stream, the current that flows through the Atlantic Ocean, like a great river, sweeping along our coast northward from the Gulf of Mexico.

We also have a River in the sky, and every clear night in winter we can trace it in the stars as it winds its way below Taurus, the Bull, westward from Rigel's beacon light to bathe the forepaws of Cetus, the Whale. It then descends the sky, and is lost to the sight of those who dwell in this latitude. It ends near the brilliant star Achernar, which is to be seen only by those who live in the Southland.

It needs a clear night to see the sky River well, but after you have studied out its course on the diagram, you can easily trace out its crooked way. Starting just to the right of Rigel, in Orion, you will see its stars as they curve out to the westward, forming a figure not unlike a horseshoe.

Virgil called this beautiful River of Stars the "King of Rivers," and it has borne many other names

such as "the River Euphrates," "the River Nile," "the River Jordan," and "the River Po."

In connection with this latter name there is an interesting story:

There was once a famous youth named Phaëthon, the son of Phœbus and Clymene. Favored by Venus, the goddess of love, he had charge of one of her temples, but this did not satisfy him, and he complained to his father that he wished to do something that would make his name great among men. His father finally agreed to grant any request that he might make.

> The youth, transported, asks without delay,
> To guide the sun's bright chariot for a day.

Phœbus, realizing the terrible danger of such an undertaking, tries to persuade his son from attempting it but finding that he was determined to carry out his plan he carefully instructed him how to drive the fierce steeds that drew the sun's chariot across the sky each day.

Phaëthon promised to obey his father's instructions, but little did he realize the difficulty of his task. No sooner had he entered the golden chariot of the sun, and gathered up the reins, than the fiery steeds were aware that their master Phœbus was not driving them, and they plunged this way and that, so that there was great danger of a terrible calamity, for the sun appeared to men to be falling, and everybody was very much alarmed.

Phaëthon Driving the Chariot of Apollo
Painting by Max Klepper

Seeing the need for prompt action to avert the threatened destruction of the world, Jupiter shot a thunderbolt from the sky which struck the unhappy and now terrified Phaëthon, and he fell headlong into the River Eridanus, or Po, as it was called. His body was found and buried by some nymphs who lived near the river.

Phaëthon's sisters were grief-stricken at their brother's tragic death, and wept all day beside his grave. Jupiter, taking pity on them, changed them into poplar trees in order that they might always be near their brother and protect his grave.

The great heat that resulted from this runaway sun parched the earth and dried up the blood of the Ethiopians, turning their skins black.

We should all try to learn a lesson from this sad experience of Phaëthon's. Although it is quite right that we should wish to do something worth while, still we must not be unreasonable, and attempt something that we are unfitted for.

THE STAR-PICTURES OF SPRING

Map showing the principal stars visible from Lat. 40° N. at 9 o'clock April 1s

THE STAR-PICTURES OF SPRING

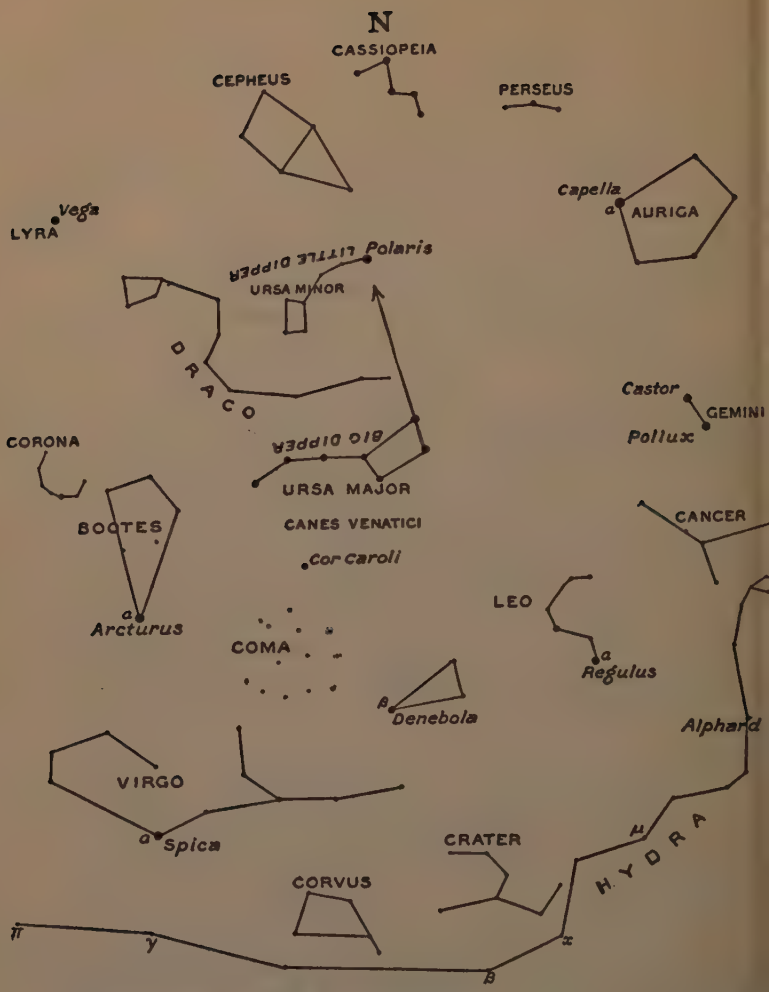
The winter stars depart, and one by one
The stars of Spring return, once more our sun
Shines fitfully, and sleeping buds and flowers
Are awakening amid April showers.

THE spring vies with the autumn in affording a good opportunity for studying the stars, owing to the fact that it is not too cold for comfort, and because the days are comparatively short.

Assuming that you are beginning your study in the spring, it is suggested that first of all you consult the diagram of the sky for mid-spring. Turn the book upside down to obtain the correct view of the northern heavens to which we will first turn our attention.

A compass will give you the direction of the north, if you do not already know its position. If you do not have a compass, stand with your right side to the east, the direction of the sunrise, and you will be facing north.

The diagram shows you the star-pictures as they appear at 8 P.M. May 8th, which is mid-spring. If you should begin your study in the early evening, about April 1st, you will see high up in the sky, almost overhead, in the northeastern sky, the seven



The Southern early evening sky in mid-spring. Turn the book upside dow
to get a correct view of the Northern sky.

bright stars that form the celebrated star-picture of Ursa Major, the Great Bear, or Big Dipper as it is familiarly called. The Dipper at this season appears upside down.

You will identify this picture at once for it looks very much like the outlined figure of a dipper, and there are no other bright stars near by to confuse you.

The two stars in the Dipper that are farthest from the stars that form the handle are called "the Pointers," and they are the stars that you should know above all others in the picture, for a line drawn from the star in the bottom of the dipper to its companion in the rim, extended a little over five times its length, points to Polaris, the North Star. Knowing this star you always have a faithful guide to direct you every clear night in the year. You can readily see that this knowledge might be very useful to you if you were ever lost at night, and the North Star has assisted thousands who have sought its guiding beams.

Polaris is of about the same brightness as the stars in the Dipper. It is in the star-picture of Ursa Minor, the Little Bear, and marks the tip of the creature's absurdly long tail. The Little Bear is also called "the Little Dipper," but its stars with the exception of two are faint, and you will need a clear night when the moon is not in the sky to trace out the figure.

It may not be amiss to caution you to select, when you are studying the stars, a place removed from all

artificial lights, as these dazzle the eyes and render it difficult to see the faint stars. As we have emphasized it is well to use a pocket electric flash light to flash on the book occasionally. Cover the end of the bulb with red tissue paper, which is a restful light for the eyes.

Between the star-pictures of the Bears lies Draco, the Dragon, that coils about the Little Bear. It is a little difficult to trace out this picture which is truly serpentine, but if you will carefully study the figure in the diagram you should be able to puzzle out the star-picture. Not far from the head of the Dragon which is represented by four fairly bright stars, you will see the beautiful steel-blue Vega, one of the brightest stars in the sky. Vega is in the star-picture of Lyra, a figure that will be described in the summer star picture group.

Turn your gaze to the northwest at about the same distance west of Polaris that Vega is east of it, and you will see another brilliant star flashing like a jewel. This is the star Capella in the picture of Auriga, the Charioteer, the famous "Goat Star," slowly wending its way to its fold in the west.

Unless you have a clear and unobstructed view of the northern sky you will have difficulty in seeing the star-pictures of Cassiopeia and Cepheus, the Queen and King, below Polaris. These pictures will be better placed for observation later in the year, and properly belong to the autumn group where you will find a description of them, and also much of interest concerning the Bears and the Dragon.

These five star-pictures are always to be seen in the northern sky, and are called the circumpolar constellations or star-pictures. They are continually circling about the star Polaris, which star may be likened to the Ring Master in the Circus. Here, with his whip, he keeps the Bears, the Dragon, and even the King and Queen forever in their places turning about him.

Facing due west you will see a number of bright stars that do not appear on the diagram. These appear on the large chart representing the entire sky view for this season. They are some of the beautiful winter stars setting in the west and a description of them will be found in the section of the book devoted to the winter stars.

It is worth while noting here a few of them because of their attractiveness and charm. About due west are the Twins, Castor and Pollux, in the star-picture of Gemini, below them is Procyon, the Little Dog star, while close to the southwestern horizon you may glimpse the brilliant Sirius, the Dog Star, the brightest star in the sky. It sets at 8 P.M. May 15th and 9 P.M. May 1st.

We will now turn to the star-pictures of spring, and trace them out one by one in the southern and eastern sky.

BOÖTES
THE HERDSMAN
OR
BEAR DRIVER

Corona Borealis
Alkalurops
Serpens
Gemma
Nekkar
BOÖTES
Mirak
Seginus
Arcturus
Muphrid
Ursa Major
Cor Caroli in Canes Venatici
Spica
Coma Berenices
Denebola in Leo
Virgo

BOÖTES

BOÖTES (bō-ō-tēz)—THE HERDSMAN OR BEAR DRIVER. (Face East)

And next Boötes comes whose ordered beams
Present a figure driving on his teams.

MANILIUS.

THE first of the spring group of star-pictures that we will look for is the kite-shaped figure representing Boötes, the giant Bear Driver.

It is an easy picture to locate because it contains the brilliant golden-yellow star Arcturus, the "harbinger of spring," which you will see at once for it is the brightest star in this part of the sky at this season.

If you are in doubt about its identity, an imaginary line drawn through the three stars in the handle of the Dipper prolonged, curves down to Arcturus.

To obtain the correct view of the figure as it appears at this season, turn the book to the right so that the giant appears to lie on his side. The kite-shaped figure outlined in the sketch can be traced out easily if you start with Arcturus, which is the star in the base of the kite, and marks the knee of the giant.

The left hand of the Herdsman is marked by three

faint stars a little to the left of the star Eta, which marks the tip of the Great Bear's tail.

There are few stars in the heavens that rival Arcturus in beauty and interest. The poet Whitman thus refers to it:

> Star of resplendent front; thy glorious eye
> Shines on me still from out yon clouded sky.

This star is often alluded to as "Job's star," a name given it because Arcturus is mentioned in the Book of Job.

Arcturus is the celestial herald of the springtide. It rises about 8 P.M. the first of March, and lovers of nature associate it with the swelling buds, the coming of the birds, and the awakening of new life in the forest, fields, and streams.

When you are acquainted with all the bright stars, you will take a personal interest in them and find that many seem to have an individuality that is charming, a personality that endears them to all lovers of the beautiful.

The name "Arcturus" means "the watcher of the Bear," a good name for this bright star, as it follows close on the heels of the Great Bear, as if guiding its course, and acting, in a sense, as a guardian.

The Arabs regarded Arcturus as "the Keeper of Heaven," while the Eskimos find it useful as a time-piece, its position in the sky informing them of the time of night.

There are a number of notable facts regarding

Arcturus that add to our interest when we know the star. It is the fourth bright star in the northern hemisphere. We are very apt to think of the stars as fixed in the sky, but in reality they are all in rapid motion, though they are so very far away from us that they do not appear to move. It is really wonderful that we know of this movement of the stars at all, but so great are the achievements of astronomical research, that we can measure the speed of many of the stars, just as we can measure the speed of a bullet's flight.

Arcturus is hurtling through space at the tremendous rate of one hundred miles a second. Its distance from us is so vast that it takes its light forty or fifty years to reach us, and light travels at the rate of 186,000 miles a second.

It is indeed difficult for anyone to get an idea of the vast distances that separate us from the stars. Authorities claim that Arcturus is one hundred and fifty times as bright as our sun.

When we think of the glory and radiance of this giant sun, its size, speed, and distance from us, it makes us feel very humble, and the affairs of our daily lives that seem of great importance, dwindle to insignificant proportions. Astronomy truly ennobles and exalts us. It increases our knowledge of the vastness and perfection of God's universe as no other study does, and that is one of the best reasons why everyone should know more about the stars.

The following illustration will give you a good

idea of the immense size of Arcturus, and its great distance from us.

Let Arcturus be represented by a globe six feet in diameter, the sun by a tennis ball, the earth by a grain of shot. Place the tennis ball two feet from the shot to represent the sun's distance from the earth; on this scale, Arcturus would be 4000 miles away.

You will observe on the figures of the star-pictures, the names of many stars. These, for the most part, are the old Arab names. They are seldom used by the professional astronomers, who prefer the Greek letter names that you will find close to the dots representing the stars on the diagrams and charts. In your study of the stars it is well for you to learn the Greek alphabet. You will find it given in the appendix.

The star Mirak is worthy of note as it is a double star, visible in a small telescope. The two stars are pale orange and bluish-green in color and the sight of these contrasting jewels is one of exquisite beauty. The astronomer Struve was so much impressed with the beauty of this double star that he gave it the name of "Pulcherima."

The stories relating to Boötes vary considerably. This is what we might expect of all the star-pictures for the stars were closely observed by the people of ancient times and in many localities, which led to a great variety of myths and legends concerning them.

Boötes was known as "the Herdsman" as well as the "Bear Driver," for the word "Boötes" is from the Greek meaning "Ox-Driver."

According to one of the stories, Boötes was robbed of his property by his brother, and suffered many hardships, but as he was industrious and of an inventive turn of mind, this led him to invent a plow which was drawn by two oxen, and with this he tilled the land.

His mother appears to have been endowed with supernatural powers, for she was so pleased with her son's invention that, on his death, she placed him in the heavens following the "Plow," which is another name for the seven stars forming the star-picture of the Dipper. In fact the figure resembles a plow, and in England this star-picture is known as "the Plough" or "Wain."

Whenever you look at Boötes you can picture the giant following the Plow, tilling the starry fields, and sowing the seeds of time.

Boötes was thought by some to be Icarus, the father of Erigone, who was killed by some shepherds for intoxicating them. Others claim that he is Erichthonius, the inventor of chariots, and he has also been called "Atlas," as he appeared to hold up the heavens.

In the picture we have of Boötes, he appears to be holding a lance or spear, which is hardly consistent with the peaceful occupation of a plowman, but perhaps this was meant to be a shepherd's staff which is quite appropriate. He appears also to hold two hunting dogs in leash, and the title of "Bear Driver" seems to fit him very well, but you can make your own choice, and Boötes will not mind which it is.

CANES VENATICI
THE HUNTING DOGS

CANES VENATICI

CANES VENATICI (kā'-nēz ve-nat'-ī-ci)—THE HUNTING DOGS.

Boötes hath unleash'd his fiery hounds.

MEREDITH.

CLOSELY associated with Boötes is the star-picture of Canes Venatici, the Hunting Dogs, which accompany the giant as he ceaselessly pursues the Bear about the Pole.

This is not much of a star-picture as it contains only one star of any importance, and it takes a good deal of imagination to picture the hounds in the sky.

They bear the attractive names of Asterion and Chara, the northern and southern hound respectively.

Draw an imaginary line from Arcturus to Beta in Ursa Major, which you remember is the first of the "Pointer" stars. About midway along this line you will see a star about as bright as the star Gamma in Boötes. This is the brightest star in the picture of the Hunting Dogs, and graces the collar that circles the neck of the hound Chara.

The name of this star is "Cor Caroli" or "Charles' Heart." It was named by Sir Charles Scarborough in honor of Charles I.

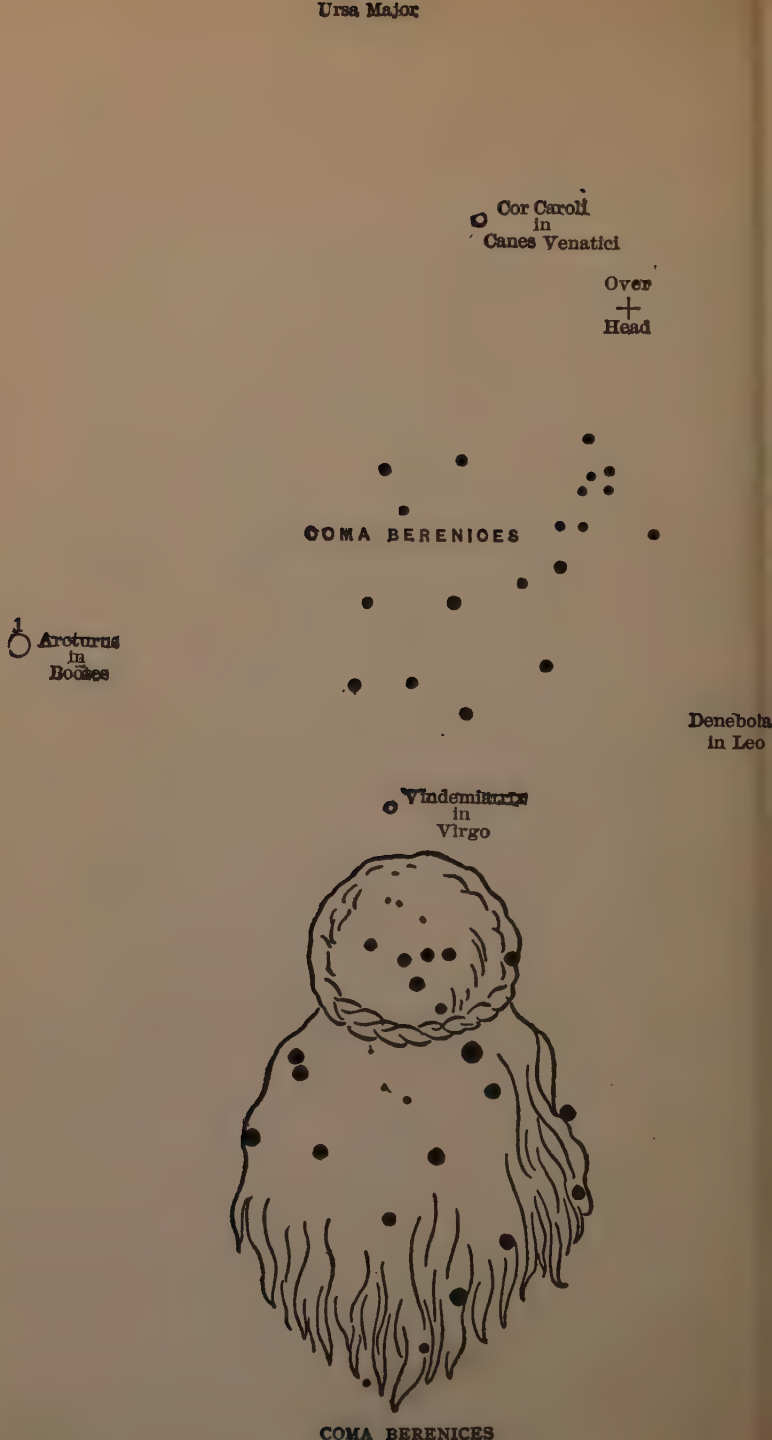
It is a beautiful double star in a small telescope,

the colors of the two stars being flushed white and pale lilac.

A short distance from Cor Caroli in the direction of the Great Bear is a slightly fainter star called "Chara" that marks the right eye of the hound. There are no other stars of importance in the picture. It is a good thing to know all the pictures even if some of them are comparatively modern and contain few interesting stars, for they are all a part of the great puzzle that we are working out and we do not want to leave out any of the pieces. They may contain stars that will assist us in locating other pictures.

MUSEUM

COMA BERENICES
BERENICE'S HAIR



COMA BERENICES

COMA BERENICES (kō′-ma ber-e-nī′-sez)—BERENICE'S HAIR. (Face East.)

Now behold the glittering maze of Berenice's hair.

An imaginary line drawn from the star Benetnasch, or Eta Ursæ Majoris, the star in the tip of the Great Bear's tail, to Cor Caroli, and prolonged an equal distance, brings us to our next star-picture, a coarse cluster of faint stars, known as Coma Berenices, one of the most "fairylike objects in the sky."

This picture is well placed for observation about April 1st, when early in the evening it is to be seen well up the eastern sky, above Arcturus, and to the right of Cor Caroli.

The famous star cluster is a beautiful sight when viewed in an opera glass. Few people realize how many of the beauties of Starland an opera glass reveals. Whenever you are out at night studying the stars have one at hand, and you will be delighted with the views of double stars of various hues, and star clusters that gleam with flashing jewels. The sight of the moon is especially attractive seen through an opera glass, and considerable detail can be identified.

Mr. Garrett P. Serviss charmingly describes the star-picture of Berenice's Hair as "a curious twin-

kling, as if gossamers spangled with dew drops were entangled there. One might think the old woman of the nursery rhyme who went to sweep the cobwebs out of the sky had skipped this corner, or else that its delicate beauty had preserved it even from her housewifely instinct."

The story of this star-picture is as follows:

There was once upon a time a lady of great beauty named Berenice. She was of a royal family, and happily married to Euergetes, one of the ancient kings of Egypt. When the King was about to set out on a dangerous expedition, Berenice was so fearful that harm would befall him that she vowed to dedicate her hair to the goddess of beauty if he returned in safety. Good fortune attended him, and on his return Berenice, true to her oath, cut off her tresses and placed them in the temple of Venus.

Later on, they were missed from the temple much to the King's regret, but Conon his astronomer consoled him by publishing the fact that Jupiter was so much inspired with the sacrifice that Berenice had made that he had taken her tresses from the temple, and enshrined them forever among the stars.

He showed the King and all the people the cluster of stars in the sky that represented the Queen's beautiful locks, and for all time they bear witness to the loving sacrifice of the beautiful Berenice.

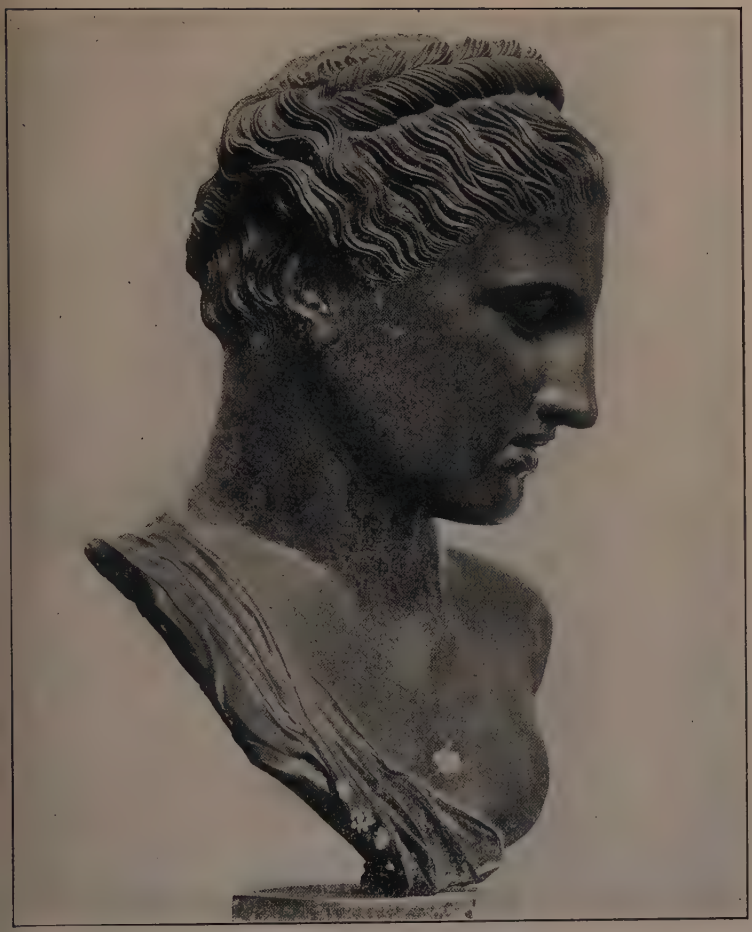


Photo by Brogi

Berenice

Bronze Bust in National Museum, Naples

CORONA BOREALIS
THE NORTHERN CROWN

CORONA BOREALIS

CORONA BOREALIS (kō-rō′-nā bō-rē-a′-lis)—THE NORTHERN CROWN. (Face East.)

> And midst the glittering symbols of the sky
> The starry crown of Ariadne glides.
>
> APOLLONIUS RHODIUS.

WE will now leave the southern sky and face east again to seek one of the most beautiful and graceful of the star-pictures, a starry Crown formed by a circlet of stars, bearing a close resemblance to a crown of sparkling jewels. It lies just off an imaginary line joining Arcturus and Vega, which is the brilliant star you will see twinkling in the northeast.

Turn the book to the right, and you will have the correct sky view of this picture at this time. You will see a little below the picture of Boötes, the charming picture of the Northern Crown.

The Crown is typically a summer star-picture, but is so high in the sky in mid-summer that it is inconvenient to observe; whereas, in the spring when it is rising it is well placed for observation. It rises in the east in the early evening about April 1st, and by mid-spring is well up the eastern sky.

Corona Borealis is composed of seven fairly bright stars, set at about equal distances apart. A line drawn from Beta to Delta in Boötes, prolonged an

equal distance, points out "Gemma," the "Pearl of the Crown," the brightest star in the picture, a star slightly fainter than Polaris. The Arab name for this star was "Alphecca" which means "the bright one of the dish," for they thought that this star group resembled a dish (which it does), but the Crown is much more beautiful.

This region of the sky is particularly interesting as a new star, or Nova, appeared close to the star Epsilon, in the Crown, on the night of May 12, 1866. It shone out with the brilliance of Gemma, and for eight days it was visible to the naked eye. It was known as the "Blaze Star."

The idea of a new star is quite a strange one to most people, but new stars appear in the sky quite often although it is only occasionally that they are very brilliant. Astronomers have not as yet found out the causes for their appearance. Perhaps it is due to a collision between a faint star and a nebula or a swarm of meteors. An authority on the subject is of the opinion that the phenomenon is due to an explosion in the star itself. What a tremendous explosion it must be to be viewed by us at such an enormous distance!

If you know your geography of the sky and study the stars attentively you may discover a Nova some night. It is always worth while to scan the sky closely whenever you are out on a clear night to see if a new star is visible. They generally appear in or near the Milky Way.

The Crown, according to the old legend, com-

The Minotaur
Painting by George Frederick Watts

memorates the diadem presented by Bacchus to Ariadne. It is related that Theseus, son of the King of Athens, was shut up in the celebrated labyrinth of Crete, to be devoured by the ferocious Minotaur confined in that place. A labyrinth is an enclosed place crossed by many hidden pathways that tend to confuse anyone who enters, and the unwary person who once gets into such a place soon becomes lost and is as good as imprisoned.

The Minotaur was a hideous monster, half man and half bull, who was accustomed to feed upon the chosen young men and maidens that he forced the Athenians to send him each year.

Theseus was one of the unfortunate number selected for the sacrifice, but he determined to kill the monster. His loved one, the beautiful Ariadne, provided him with a sword and a spool of thread which he unwound as he penetrated into the labyrinth. He was successful in killing the Minotaur, and escaped from the labyrinth by following the thread.

Sad to relate, although Theseus married Ariadne as he had promised to do he basely deserted her later. The god Bacchus, taking pity on her, married her, and gave her a beautiful golden crown, which on her death was transferred to the stars, and thus this star-picture is often called "Ariadne's Crown."

The Shawnee Indians of our own country called this star-picture "the Celestial Sisters," and have an interesting legend respecting it, which is a typical example of the imaginative power possessed alike by

the red men of North America, and the far-off wandering tribes of the ancient world. The legend is as follows:

"White Hawk," a mighty hunter, was searching for game. He suddenly found himself on the outskirts of a great prairie, where he perceived a circular path worn through the grass with no path leading to it. While he stood wondering at the strange pathway, he saw descending from the heavens a silver basket containing twelve beautiful maidens. As the basket touched the ground they alighted and began dancing about the ring, beating time on a silver ball. White Hawk endeavored to capture the most beautiful of the maidens, but they all leaped into the basket which was instantly carried up into the sky. The next day White Hawk revisited the spot disguised as a rabbit, and tried in vain to seize one of the dancers. The day following, in the guise of a mouse, he was more successful, and succeeded in catching the most bewitching maiden, and took her home as his bride. She soon became homesick, however, and one day when White Hawk was absent she made a silver basket, and singing her magic chant was carried to the heavens, where she appears now as one of the bright stars near the Crown, the star Arcturus in the star-picture of Boötes.

The Indians also imagined that this star-traced circle represented a council of Chiefs, and the star in the centre of the circle was the servant, cooking over the fire, preparing the feast.

HERCULES
THE KNEELER

The Head
of Draco
Bootes
Vega
in Lyra
Over
Head
Gt. Cluster
13 M.
Gemma
in
Corona Borealis
HERCULES
Masym
CERBERUS
Kornephoros
Marfik
Cujam
Ras Algethi
Ras Alhague
in Ophiuchus
Serpens

HERCULES

HERCULES (her-ku-lez)—THE KNEELER. (Face East.)

Hercules with flashing mace.

BRYANT.

WE come now to one of the most ancient and famous star-pictures in the sky, bearing the magic name of "Hercules," that suggests all sorts of interesting and stirring stories of mighty deeds and valiant contests.

Although properly a summer star-picture, Hercules is so nearly overhead in mid-summer that it is difficult to trace out his stars without craning our necks too much for comfort, so we will look for it in the early evening in mid-spring in the northeast and east where the huge figure of the giant is rising on his side just as the Herdsman rises.

You will note that in the sketch the figure is upright. To obtain the correct sky view, reverse the picture and turn the book to the right. The star Ras Algethi is in the giant's head which is to the south, while his foot crushes the head of the Dragon in the north.

The picture is not clear of the horizon in the early evening until May 1st. If you wish to trace it out

earlier in the season you will find it up at 9 P.M. April 15th, and 10 P.M. April 1st.

In the sketch you will see that Hercules lies between Gemma, the bright star in the Crown, and Vega, the flashing brilliant in the star-picture of the Lyre.

The four stars Epsilon, Zeta, Eta, and Pi, form the figure of a keystone, which enables you to identify the picture.

The origin of this picture is shrouded in mystery. The ancients knew it as "the Phantom," "the Kneeling One," and "the Man upon his Knees," and it was worshipped in Phœnicia as the sky representative of the great star god Melkarth.

In the giant's right hand appears a club raised on high, and in his left hand he is supposed to hold an apple branch in which serpents are entangled. The stars representing this branch at one time formed a little star-picture or asterism called "Cerberus."

The star Alpha Hercules, or "Ras Algethi," is a beautiful double star for a small telescope, with a fine contrast of colors, orange-red and bluish-green. The Chinese called this star "the Emperor's Throne."

There is a most remarkable telescopic object in Hercules which is located between the stars Eta and Zeta. It is a great cluster of stars, that is said to contain 60,000 stars, a great swarm of flashing suns. The largest telescopes are necessary to separate the stars and obtain any idea of their glorious nature. It is one of a large number of clusters that baffle description. This cluster is 36,000 light-years away,

Photo by Brogi

The Infant Hercules Strangling the Serpents at Pompeii

and is just visible to the naked eye on a clear night as a dim misty patch of diffused light. See if you can see it.

This star-picture immortalizes the name of Hercules, the famous Theban, celebrated in ancient song and legend for his "heroic valour and invincible prowess."

Even in his youth Hercules distinguished himself for bravery, for when he was only eight months old, he strangled two serpents that the jealous Juno placed near him to bring about his death. At an early age he killed a ferocious lion that had caused havoc among his father's flocks.

Our hero was educated by the centaur Chiron, and received instruction in chariot driving, archery, and fighting, and in singing and playing the lyre, from the best instructors.

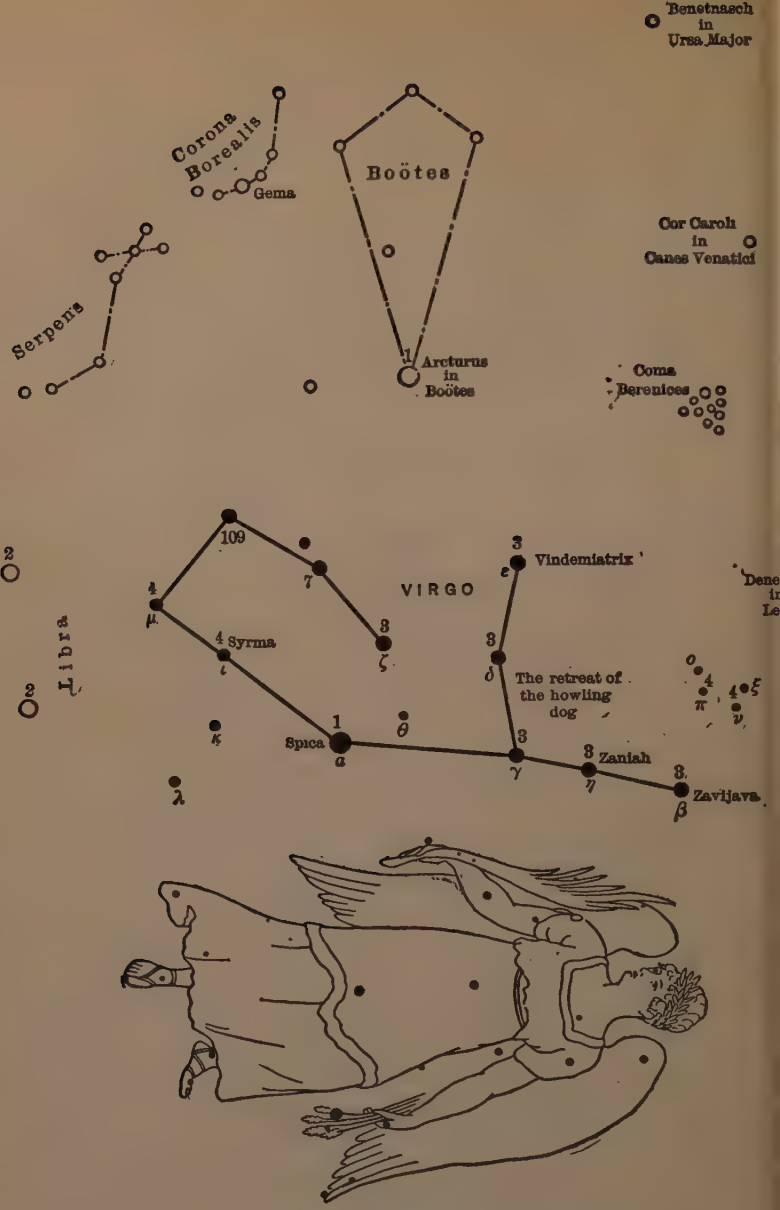
For twelve years Hercules was subjected by Juno to obey the will of Eurytheus his half brother, and was promised immortality if he performed twelve tasks that were regarded as impossible.

These, in spite of every obstacle, he accomplished. You must read in mythology of the twelve labors imposed on and accomplished by Hercules for they make very interesting reading. Space does not permit of their recital here.

Such a display of valor should have earned a peaceful end for the hero, but sad to relate, one day he unwittingly put on a tunic that contained a deadly poison, and in terrible torture he climbed to the summit of Mount Oeta, where he built a great funeral

pyre. On this he spread his famous lion's skin, and reclining upon it thus perished in the flames. But Jupiter took pity on him, a cloud descended and carried him up to the high heavens, where, it is said, he married Hebe, the cupbearer to the gods, and lived happily ever after, his stars forever flashing to mankind the glory of his fame, and the memory of his heroic deeds.

VIRGO
THE VIRGIN


Benetnasch
in
Ursa Major
Corona
Borealis
Gema
Boötes
Cor Caroli
in
Canes Venatici
Serpens
Arcturus
in
Boötes
Coma
Berenices
109
Vindemiatrix
VIRGO
Syrma
Libra
The retreat of
the howling
dog
Spica
Zaniah
Zavijava

VIRGO

VIRGO (ver′-gō)—THE VIRGIN.
(Face Southeast.)

Below Boötes thou seest the Virgin
An ear of corn held sparkling in her hand.
ARATOS.

FACING as directed, to the southeast, you will see flashing like the purest diamond, the beautiful white star Spica in the star-picture of Virgo the Virgin. It is quite unmistakable as there are no other bright stars in the vicinity, but if you are in doubt as to its identity, take as pointer stars the star Eta in the Great Bear and Cor Caroli, an imaginary line drawn from the former through the latter, prolonged about three times its length, ends near Spica.

A glance at the diagram of the star-picture will show you its position with reference to the star-pictures of spring that you already know. The poet Aratos thus beautifully describes the Virgin:

Her lovely tresses glow with starry light;
Stars ornament the bracelet on her hand
Her vest in ample fold, glitters with stars;
Beneath her snowy feet they shine; her eyes
Lighten, all glorious, with the heavenly rays,
But *first* the star which crowns the golden sheaf.

Spica, the "Queen Star of the Spring," rises soon after sunset in the early part of April, and during April and May its pure white rays grace the eastern skies. Spica is not as bright a star as Arcturus, but it is a star of loveliness and charm, typical of gentle spring, and balmy breezes. When you know the bright stars you will be sure to ascribe to them human attributes, for they seem to differ as people do, and some have a special attraction for us.

The name "Spica" means an "ear of wheat," and you will see in the picture that the star marks the sheaf of wheat which the virgin holds in her left hand.

Spica, the typically spring star, is appropriately white. It is so far away from us that astronomers have not been able to measure its distance. It has a companion star, but the attendant on Spica has never been seen by mortal eye. The wonderful instrument, the spectroscope, has revealed its presence.

Spica was known in olden times as "the Star of Prosperity," and the ancient Egyptians built temples to the worship of this snow-white sun. A knowledge of the fascinating history of the stars adds greatly to our interest when we know them intimately, and you should study this history so that when you gaze at them you may think of all they have meant to the people who lived in past and forgotten ages.

The star Gamma in the Virgin was known to the Latins as "Porrima." Its chief interest lies in the fact that it is a double star, a glorious sight in a small telescope. The twin suns are of about the

same apparent size and brilliance, and revolve about a common centre, making one complete revolution in about 180 years.

The star Epsilon bears the name of "Vindemiatrix" which means "Grape Gatherer," because it rises in the morning just before the time of the vintage.

Virgo is one of the very ancient star-pictures, and doubtless was one of the first to receive a name. It lies in the Zodiac, which is the pathway traced in the sky along which the sun, moon, and planets apparently move. The Zodiac is divided into twelve equal divisions, each one of which is occupied by a star-picture. When you are acquainted with all of these pictures you will know where to look for the planets, which are bodies smaller than the stars, much nearer to us than they are, and which shine only by the reflected light from the sun.

According to the poets of old Virgo represents Astræa, the daughter of Jupiter and Themis, the goddess of justice. During the golden age when, it is said, the gods lived upon the earth, Astræa ruled the world and was held in high respect and reverence by all mankind. Times changed, and in the succeeding Brazen and Iron ages the wickedness of men offended the goddess and she left the world to its fate, and returned to heaven. She took her place in the golden girdle of the Zodiac with the scales of Justice (represented by the star-picture of Libra) beside her.

In ancient Egyptian mythology Virgo was associated with the goddess Isis. It is related that at one

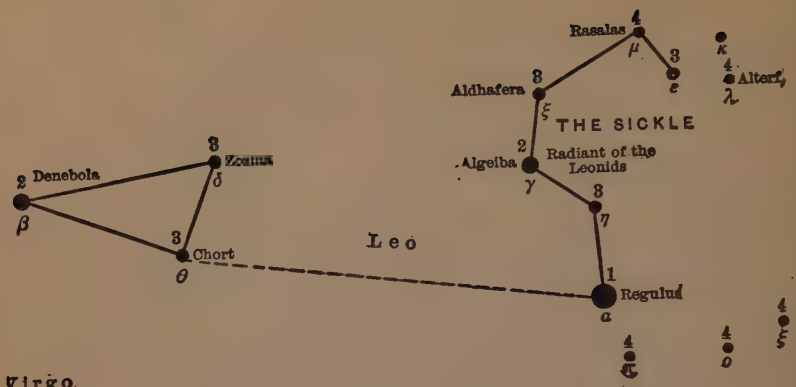
time when she was pursued by the monster Typhon, she dropped the sheaf of corn which she held in her hand, and the scattered corn became the faint glistening stars that form the Milky Way.

The Chinese, whose astronomy is very ancient, call the Zodiac the "Yellow Road" because of its resemblance to a pathway strewn with kernels of golden corn.

It may be of interest to note in passing that within the confines of this star-picture is what is known as "the Field of the Nebulæ," where about three hundred of these dim mysterious gaseous objects are scattered about the sky. Unfortunately, with the exception of the nebula in Andromeda, they are only to be seen in a telescope, but it is worth knowing where this "starry meadow" is located, for, as Mr. Serviss says, the nebula is "a true symbol of spring, the nebulæ being in a certain sense, the seeds of uncreated suns."

There is a vast amount of interesting material relating to this ancient and time-honoured star-picture which we have not space for here. You will surely be interested to read more about the Virgin in the stars when you have traced out her stars in the sky.

LEO
THE LION


Rasalas
μ
4
3
e
κ
4
Alterf
λ
Aldhafera
8
ξ
THE SICKLE
2
Algeiba
γ
Radiant of the Leonids
3
7
1
Regulus
a
Leo
3
Zosma
δ
2 Denebola
β
3
Chort
θ
4
ξ
4
o
4
Virgo

Alphard
in Hydra
(red)

LEO

LEO (lē′-o)—THE LION. (Face South.)

Neath her hind feet as rushing on his prey
The lordly Lion greets the God of day.

ARATOS.

THE above lines refer to the location of the next star-picture we will study, the fierce Lion that prowls in the sky jungle below the hind feet of the Great Bear.

You recall the two "Pointer" stars in the Great Bear that always guide your eyes to Polaris? If you imagine a line drawn through them in the opposite direction from Polaris, and prolonged southward, this will serve to point out to you the star-picture of the celebrated Lion in the sky.

There are six stars in this picture that form a figure very like a sickle, which you cannot fail to see after you have taken a glance at the diagram which gives you the figure outlined.

"The Sickle, in its entirety," says Mr. Serviss, "is an attractive asterism, and hanging so conspicuously in the sky on a spring evening it may be imaginatively regarded as a harbinger of the opening of the season when the thoughts of men are turning to preparations for the future harvests."

The stars in the Sickle form the head and fore

quarters of the king of beasts, while a triangle formed of three stars to the left of the Sickle forms his hind quarters. The brightest star in this triangle is named "Denebola." It is located in the tip of the Lion's tail.

To make sure that you have located the picture, look for the striking figure known as the "Diamond of Virgo." Beginning with the star Arcturus in Boötes let your eyes trace their way up to Cor Caroli, then down to Denebola, and to the left still further down the sky to Spica in the Virgin. This forms a diamond-shaped figure, with a bright star at each of its four points, the famous "Diamond of Virgo."

In mid-spring Leo is about due south in the early evening, and well up the sky. The picture is seen to good advantage earlier in the year, about March 1st, when we see it rising in the east about 8 P.M.

Leo lies in the Zodiac next to Virgo, and is a very ancient and famous star-picture. Regarding the twelve star-pictures of the Zodiac there is an old rhyme that gives you their names in order. You will find this in the Appendix, and if you commit it to memory it will always assist you to remember the star-pictures along this famous pathway, and the order in which they are arranged.

The brightest star in Leo is the brilliant "Regulus," the "King Star," thus named because from the earliest times it was thought to rule the affairs of heaven. It was called "the King," "the Mighty,"

"the Great," "the Hero," by the powerful nations that existed thousands of years ago.

On a very ancient record that has come down to us we read: "If the star of the great lion is gloomy, the heart of the people will not rejoice."

The early Persians regarded Regulus as one of the four Guardian Stars of Heaven, the four Royal stars, the other three being, Fomalhaut, Aldebaran, and Antares, stars that you will come to know later.

Regulus is white in color, and is located in the heart of the Lion, and marks the tip of the handle of the Sickle. It is one of the huge stars of the universe, and the twentieth in the order of brightness. Authorities tell us that Regulus sends out three hundred times as much light as our sun. It is so far away that it takes its light ninety-nine years to reach us, so that we see it to-night not as it is, but as it was ninety-nine years ago. In other words, if the light of Regulus should be extinguished to-night we would not know it till ninety-nine years had elapsed.

Denebola, or Beta Leonis, is the second star in brightness in the picture, and is just a trifle fainter than Polaris. The name is Arabic and means "the Lion's tail." It is about ten times as bright as the sun, and is twenty-five light-years away. A light-year is the unit of measurement of the distance that separates us from the stars. It is the distance that light travels in one year, at the rate of 186,000 miles a second.

The star Gamma bears the Arab star name of

"Algeiba." It is a beautiful colored double star, visible in a small telescope.

When you are acquainted with the star-pictures you must surely get a telescope to explore Starland more intimately. Telescopes are very cheap as compared with the pleasure they afford, and if you have a glass you have a source of enjoyment that is inexhaustible and exalting.

The center of the Sickle marks the spot where a wonderful display of meteors occurred in 1833, and 1866. Meteors are generally but incorrectly called "falling stars." Of course the stars do not fall. They are giant suns and if they came anywhere near us we should all be burned up. Meteors are only particles of matter that are attracted to the earth much in the same way that moths are attracted to a lighted lamp, except that in the case of the meteors it is the mass of the earth that attracts them. As they dart toward the earth they encounter the earth's atmosphere and friction sets them on fire, and they continue to streak down the sky all aflame leaving a long train of fire. Most of them are consumed before they reach the earth and only the ashes of them reach the earth, but occasionally one is so large that it is not entirely consumed and it strikes the earth and generally buries itself in the ground. They are mostly composed of iron, nickle, and other metals, and are enormously heavy.

Commander Peary brought a nuge meteor back from Greenland some years ago, which is now on exhibition at the Museum of Natural History in New

York City. It is eleven feet long, five feet wide, and weighs thirty-six tons.

The meteors that stream from Leo are called the "Leonids," and we must look for them in November. The shower of meteors that occurred on the night of November 13, 1833, was most remarkable, and doubtless one of the most sublime and awe-inspiring sights that human eyes have ever beheld. Then, it is said, there was literally a rain of fire. Meteors in countless numbers filled the heavens, like showers of rockets. People thought that the end of the world had come, and there was great excitement, until astronomers had explained the phenomenon.

Every thirty years we may expect an unusual display, but those since 1866 have been disappointing. It is the generally accepted theory that these swarms of meteors are related to comets that have, for some reason or other, burst and disintegrated. When the earth as it circles the sun encounters this scattered collection of cometary matter we are bombarded by meteors. Imagine that you are walking around some one who is sprinkling a lawn with a hose, and if you are near enough to him you will be sprinkled by the water at some point. This is precisely what happens to the earth in its course, it is sprinkled with the scattered bits of some old comet.

According to the ancient Greek fable, Leo represents the fierce lion that was said to roam about in the jungles of Nemæa. It was strangled to death by the mighty Hercules after a terrific struggle, and

Jupiter, to commemorate the event, placed the Lion and his destroyer among the stars.

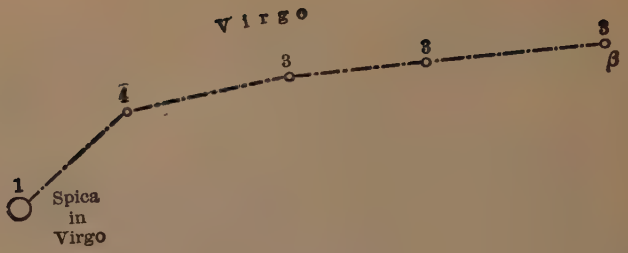
The Egyptians were especially interested in this star-picture, as they were in terror of their lives from lions that roamed about the banks of the river Nile when it was in flood. As flood time occurred at the time of year when the sun was apparently moving through the stars in this picture, it was natural that their astronomers should have figured a lion in this part of the sky.

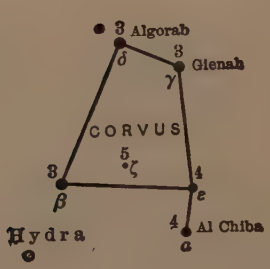
The rising of the river Nile was an all-important factor in the lives of the Egyptians, and because the sun was in Leo when this great event occurred they worshipped these stars.

From remote antiquity the Lion has been identified with the Sun, and we see the same figure on the Royal Arms of England, symbolizing the Lion of the Zodiac.

Space does not permit of a more extended account of the legendary history of this famous group of stars.

CORVUS
THE CROW


Virgo
3
3
3
β
4
1
Spica
in
Virgo


3 Algorab
δ
3
Gienah
γ
CORVUS
5
ζ
3
4
β
ε
4
Al Chiba
α
Hydra

Crater

CORVUS

CORVUS (kôr′-vus)—THE CROW. (Face South.)

The figure of a Crow seems pecking at him.
ARATOS.

THERE are two star-pictures closely associated with Hydra, as they are located almost on the coils of the reptile. These are the pictures of Corvus and Crater, the Crow and the Cup, attractive little pictures, particularly the former which we will now seek.

Corvus is about due south of Cor Caroli, and between and below Spica and Denebola. It rises in the southeast in the early evening about April 1st, and the last week in May we see it about due south.

The picture contains five stars, three of which are fairly bright, and the stars when joined by lines form a figure "4" which is easily traced out. The two upper stars in this figure called "Gienah" and "Algorab" make very good "Pointer" stars for Spica, the bright star in the Virgin.

The star "Al Chiba" is an orange-colored star, and Beta of ruddy yellow hue. Delta Corvi is a fine double star, visible in a small telescope, the contrasting colors of the twins being yellow and purple.

The Chinese called this picture "the Red Bird," the Romans and Hebrews "the Raven," and in very

ancient times it has borne these titles: "the Great Storm Bird," "the Bird of the Desert," "the Bird of the Great Seed," and "the Storm Wind."

It is said that the crow was once of the purest white, but it was changed to its present sable hue for tale bearing. "A fit punishment for such a fault," says Burritt.

According to the Greek fable, the Crow was placed among the stars by Apollo. Apollo, we are told, fell in love with Coronis, but being of an extremely jealous disposition, he sent a crow to spy upon the object of his affections. The Crow discovered that Coronis was untrue to Apollo and informed him of the fact; then

> the color left his look
> The wreath his head, the harp his hand forsook;
> The silver bow, and feathered shafts he took,
> And lodged an arrow in her tender breast,
> That had so often to his own been prest.

To reward the Crow for his service as an informer, Apollo placed the bird among the stars, but we cannot look upon him with a very high regard, when we think of his base actions.

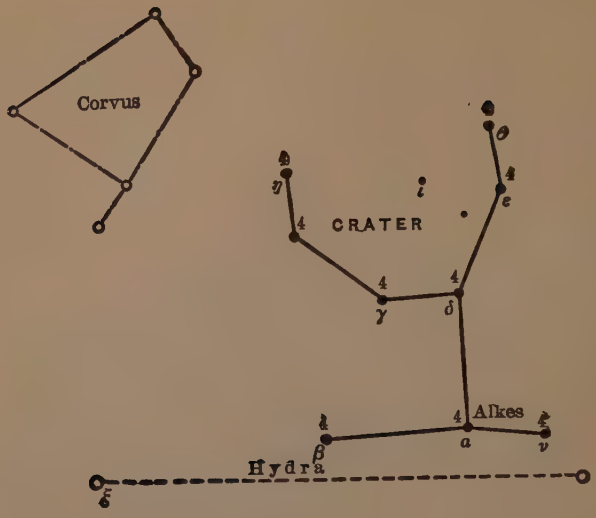
It is also said that this star-picture takes its name from the daughter of Coronæus, King of Phocis, who was transformed into a crow by Minerva to rescue the maid from the pursuit of Neptune.

Another myth relates that Apollo sent the Crow to bring some water for a sacrifice to Jupiter, but the bird tarried at a fig tree till the fruit became ripe,

and then returned to the god with a water snake in its claws, and a lie on its tongue, claiming that the snake occasioned the delay. Apollo perceived the untruth, and to punish the Crow, placed him among the stars with the Cup and the Snake. The latter was charged never to allow the Crow to drink, so the Crow is forever tantalized with the cup of water near at hand into which he can never dip his bill.

This is one of the few cases where a creature was placed among the stars by the gods as a punishment.

CRATER
THE CUP



CRATER

CRATER (krā′-ter)—THE CUP. (Face South.)

Midway
His volume is the Cup.
ARATOS, referring to Hydra.

MANY people who have a pretty good knowledge of the star-pictures have never seen the Cup in the sky owing to the fact that it is composed of rather faint stars, and is well down the southern sky.

Study the diagram and sketch of the picture and these will guide you in your search for the Cup, but it is useless to look for it unless you have a clear moonless night.

The bowl of the Cup is fairly well outlined by faint stars. The two upper stars in Corvus point to the right to Crater which stands next to it on the coils of the Hydra.

Crater is due south in the early evening in mid-spring, May 8th, and this is a good time to search for it. The star "Alkes" is common to the star-pictures of Hydra and Crater.

In the old atlases the Cup is usually represented in the form of a large urn, elaborately ornamented, with two handles set opposite each other, and rising above the rim of the bowl.

Regarding the legendary ownership of the Cup we

have quite a choice. It has figured as the Cup of Apollo, Hercules, Achilles, Dido, Medea, Bacchus, Icarius, and even Noah's wine cup.

For the Egyptians, the rising of Crater was an event of some importance, as at this time the river Nile reached its greatest height, and the people knew that its flood would soon recede.

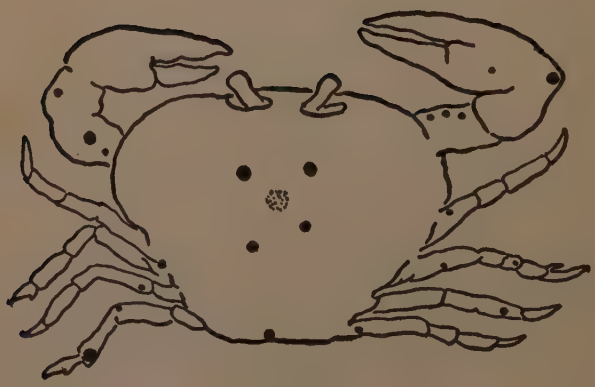
There is an ancient vase in the Warwick collection on which are inscribed the following lines:

> Wise ancients knew when Crater rose in sight,
> Nile's fertile deluge had attained its height.

Crater was known in England two or three centuries ago as the "Two-handed Pot."

CANCER
THE CRAB

CANCER
Acubens
α
Asellus Borealis
γ
Asellus Australis
δ
Præsepe
The Bee Hive
Head of Hydra
Tegmen
ζ
β
Pollux
Gemini
Canis Minor
Procyon



CANCER

CANCER (kan′-ser)—THE CRAB. (Face Southwest.)

. . . and there a crab
Puts coldly out its gradual shadow claws.
MRS. BROWNING.

THE star-pictures that we have been studying have been composed of fairly bright stars, and it has not been at all difficult to trace them out; but now we come to one that contains only faint stars.

Cancer, the Crab, is the most inconspicuous star-picture of the twelve that comprise the Zodiac. It is appropriate that only dim stars should mark such a creature, for a Crab is certainly insignificant as compared with a Bear or a Lion, for instance. After all, it is well that some of the star-pictures are faint and rather difficult to locate, for this makes the search for them all the more interesting.

You will need a good clear night, when the moon is not in the sky, to see the star-picture of the Crab. Study the diagram carefully, then draw an imaginary line from Denebola to the star Gamma in the "Sickle." Extend this line an equal distance, and it will end in the star-picture of Cancer.

The stars of the Crab form a "Y" shaped figure, but the "Y" is upside down thus Λ. Directly below

this inverted "Y" is a pretty group of five stars that form the head of Hydra, the Water Snake, a picture that we will study later. To obtain the correct sky view of Cancer from the sketch turn the book to the right.

Cancer is due south about 8 P.M. April 1st. In mid-spring we must look for it in the southwest well up the sky.

About at the junction point of the upright, and the branching lines that form the inverted "Y," you will see a dim, misty-looking object which has been often mistaken for a comet. It is a beautiful cluster of stars called "Præsepe, the Manger," but a more familiar name for it is "the Bee Hive." It has been said to resemble a "bit of star-spangled cobweb floating in the sky." You must be sure to look at the cluster with your opera glass, for it is a glorious sight. The cluster contains 363 stars; see if you can count them all!

This interesting object serves to identify the star-picture. The first sight of these stars by Galileo, filled him with delight and amazement. It was one of the first conquests of his telescope.

The star named "Acubens," which is the Arab name of Alpha Cancri, is located in the southern claw of the Crab. The name means "the Claws."

The "Bee Hive" is in the centre of a four-sided figure formed by four faint stars, as indicated on the sketch. You will note that the two brighter stars of this figure are named "Asellus Australis," and "Asellus Borealis," Greek star names that mean

the southern ass and the northern ass respectively. The Greeks and Arabs imagined that these two stars represented two asses feeding at the Manger.

The "Bee Hive" has quite an interesting history, for in ancient times it was regarded as a sort of barometer or weather guide. Pliny thus refers to the cluster:

"If Præsepe is not visible in a clear sky it foretells the coming of a violent storm," and Aratos in like vein writes:

A murky Manger with both stars shining unaltered, is a sign of rain.

The star Iota Cancri is a fine wide double star. A good field glass should divide the pair, but a small telescope is required to show the beautifully contrasting colors of the twin stars, which are yellow and blue.

The star Zeta Cancri is a triple star, but a telescope is required to see the three stars. The system is particularly interesting to astronomers.

Macrobius tells us that the name "Cancer" was selected by the Chaldeans to represent this star-picture, because the crab, being an animal that walks backwards or obliquely, well typifies the sun's apparent retrograde movement when it was in this part of the Zodiac.

According to the Greek legend, while the valiant Hercules was engaged in his famous contest with the dreadful Lernæan monster, Juno, envious of the

fame of his achievement, sent a sea crab to bite and annoy the hero's feet; but Hercules quickly crushed it under his heel, and Juno, to reward the creature for "doing its bit" so to speak, persuaded Jupiter to place the crab among the stars.

The following story accounts for the presence of the two asses in this star-picture:

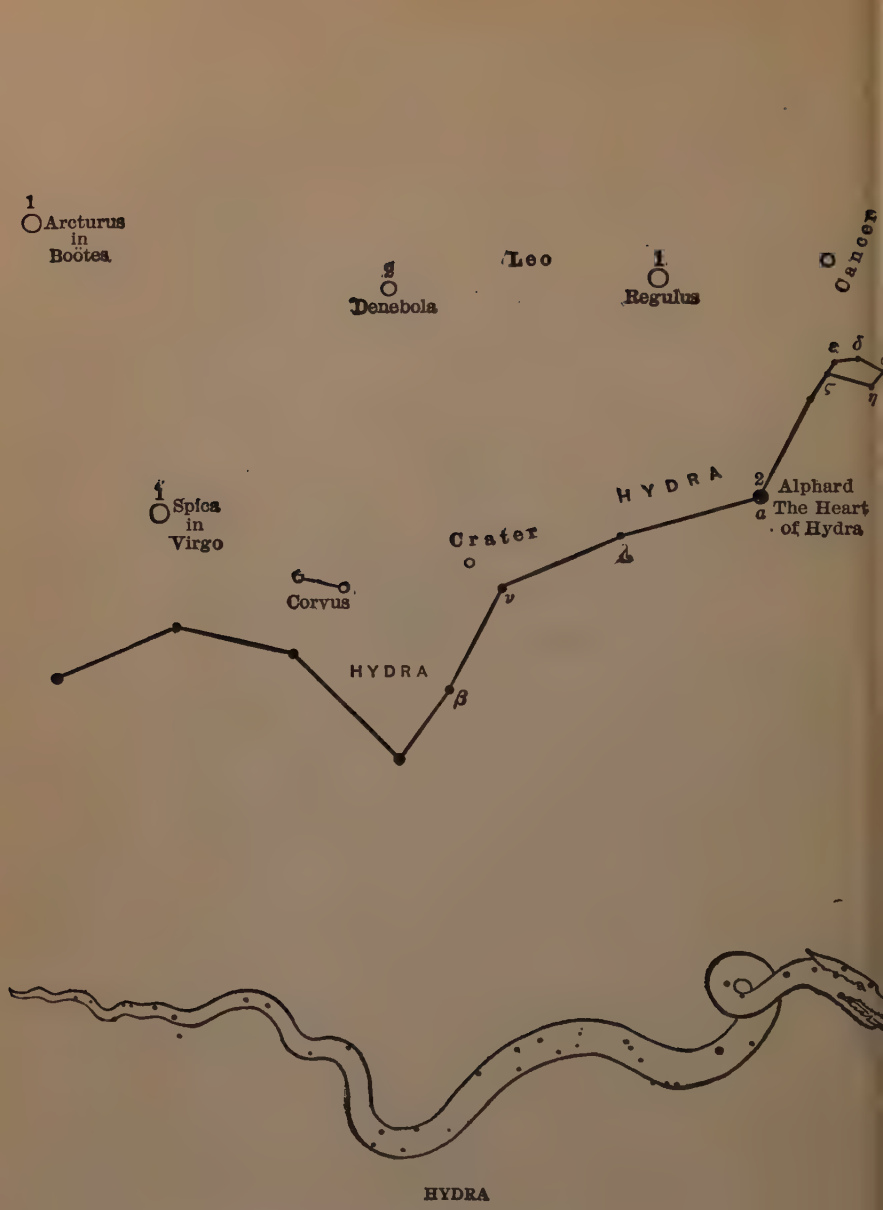
Once upon a time, the god Bacchus while on his way to the temple of Jove, came to a marsh which barred his way. He perceived two wild asses browsing about near by, and mounting one, crossed the marsh dry shod. In gratitude for this service rendered by the faithful creature, he placed both of them among the stars.

All through mythological history we find many instances where lowly creatures, by reason of a service that they cheerfully rendered, were immortalized by a place in the high heavens, where they shine down upon us nightly, ever proclaiming the truth to mortals that good deeds have their reward.

HYDRA

THE WATER SNAKE

WATER PIOLIOT


1
Arcturus
in
Boötes
2
Denebola
Leo
1
Regulus
Cancer
δ
ε
ζ
η
2
Alphard
The Heart
of Hydra
HYDRA
1
Spica
in
Virgo
Crater
Corvus
HYDRA
β
ν
α

HYDRA

HYDRA (hi'-dra)—THE WATER SNAKE. (Face South.)

But lo! afar another constellation,
They call it Hydra like a living creature.
'Tis long drawn out. His head moves on below
The midst of the Crab; his length below the Lion
His tail hangs o'er the Centaur's self.

FROTHINGHAM'S ARATOS.

IT is fitting that, after studying the stars of the Crab we should seek out the star-picture of another sea creature, this time a huge snake, the sky mate of the sea serpent that every once in a while mariners tell us they glimpse rising out of the ocean.

A glance at the diagram and sketch will show you where to look in the sky for this starry serpent. Start with a fairly bright and attractive group of stars that mark the head of the creature which faces west. You will see it a little below the inverted "Y" of Cancer.

The coils of the snake, marked by faint stars, can be traced on a clear moonless night all the way across the southern sky in the early evenings in mid-spring underlying the star-pictures of the Lion and Virgin.

Hydra contains only one bright star called "Alphard" or "Cor Hydræ," which means "the solitary

one." It is orange in color and lies in the heart of the reptile, below, and about an equal distance from Regulus in Leo and Acubens in Cancer. Because of its color and the lonely position it occupies you can hardly fail to see it.

Now trace the faint stars eastward, that is to the left, well down the sky below Regulus, Denebola, and even to the left of Spica.

An imaginary line drawn from the star Delta in the Virgin through Spica, extended a trifle over its length, points to the star Pi in Hydra which marks the tip of the reptile's tail.

According to the old legend, the Hydra was a terrible monster that lived near the marshes of Lerna. It had a large number of heads which were peculiar in this respect, as fast as one was cut off, two immediately grew in its place, unless the wounds were seared with a hot iron.

The hero Hercules set himself the task of slaying this terrible creature, and was assisted by his faithful nephew Iolaus, who, as fast as Hercules cut off a head applied a red hot iron to the wound. In this way the monster was quickly slain. It was while Hercules was killing the monster that Juno sent a crab to annoy him, as you read in the story of Cancer.

Hercules dipped his arrows in the gall of the Hydra, and this rendered a wound from them incurable. The central head of the creature was supposed to be immortal and this one Hercules buried deep under a rock.

Photo by Anderson

Hercules and the Hydra
Uffizi Gallery at Florence

The long extended and serpentine figure of the Hydra somewhat resembles a wandering stream, and the Egyptians regarded this star-picture as a heavenly counterpart of their famous river Nile.

THE STAR-PICTURES OF SUMMER

Maps showing the principal stars visible from Lat. 40° N. at 9 o'clock, July first.

THE STAR-PICTURES OF SUMMER

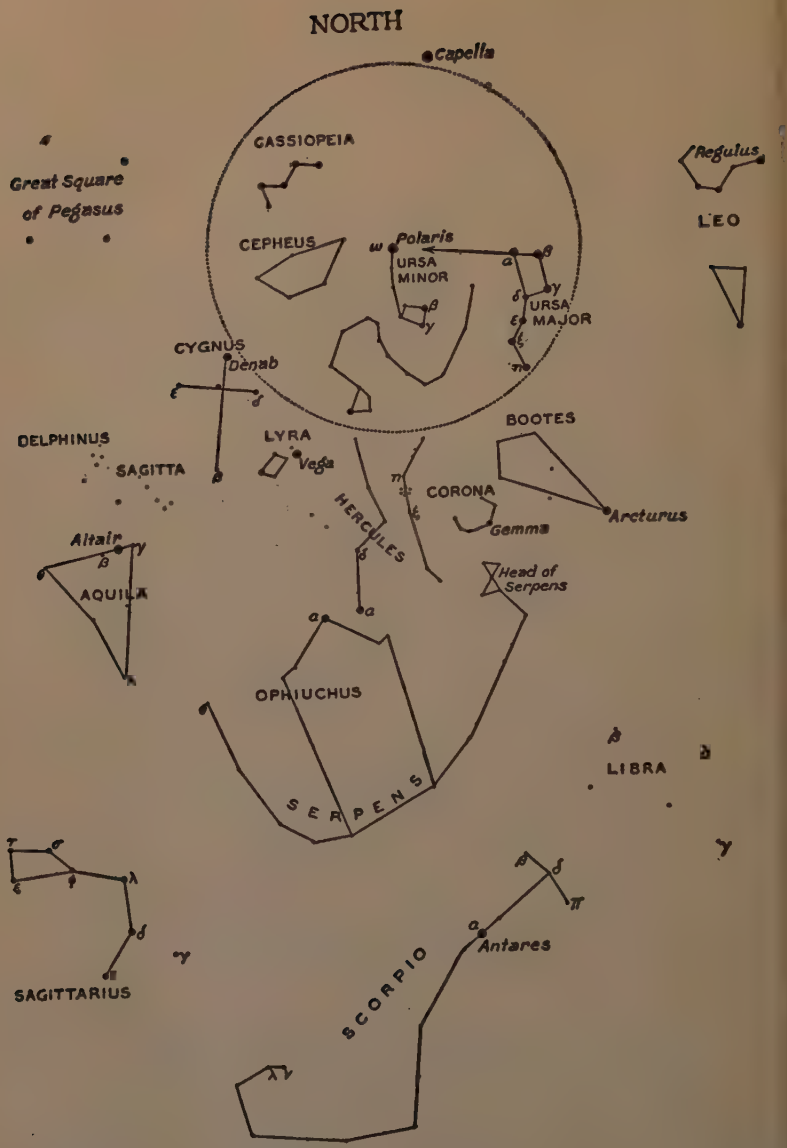
Silently one by one, in the infinite meadows of heaven,
Blossom'd the lovely stars, the forget-me-nots of the angels.

LONGFELLOW.

SUMMER is the most favorable season of the year for beginning the study of the starry skies, partly because the nights are comfortable out of doors, and partly for the reason that summer is the vacation season when people are spending their leisure time at the seashore or in the mountains, and have an opportunity of enjoying the beauty that nature bestows on life.

When the day is done and we stroll out in the early evening along mountain paths, or sit on the porch overlooking the sea, the call of the twinkling stars lures our gaze upwards, and then it is that we are captivated and charmed with the beauty of the shining hosts, and long to know the names of the stars, and the fascinating history of the ancient star-pictures.

Let us first take a glance at the diagram and look particularly at the star-pictures of the northern sky, which region we will first explore, for the North Star and its immediate neighbors are with us the year



The Southern early evening sky in mid-summer. Turn the book upside down to get a correct view of the Northern sky.

round, and we should seek their acquaintance first.

Turn the book upside down to obtain the correct view of the star-pictures as they appear in the northern sky in the early evening in mid-summer.

Within the circle on the diagram you will notice the five star-pictures bearing the names of Ursa Major, Ursa Minor, Cassiopeia, Cepheus, and Draco. These are the circumpolar star-pictures that continually circle about Polaris, the North Star, in a direction contrary to the hands of a clock.

The stars do not really move about the pole, and this movement is only an apparent one, for it is the earth that is in motion and this movement makes the stars appear to move.

You have often been on a train that has stopped at a station close to a train on another track. You look out at this train, and presently you feel sure that your train is in motion, although there is no noise to indicate that fact; and then you look closely and perceive that your train is at rest, and the other train is pulling out of the station.

We see the same thing when we survey the night sky. The earth is so large that we do not realize that it is in motion, but it turns about on its axis once in every twenty-four hours.

Take a long hat pin and thrust it through the centre of an orange. Let the orange represent the earth. Twirl the pin about, holding it at each end, and you have a very good illustration of the way the earth turns on its axis. The earth turns east-

ward, and this makes the sun and stars appear to rise in the east and set in the west.

It is well to caution you at the outset to select as a place of observation a spot where there are no artificial lights in the vicinity, as these tend to dim the light of the stars. To illuminate the pages of your book, use an electric pocket flashlight with a piece of red tissue paper covering the bulb, which gives you sufficient light and yet does not dazzle the eye.

Now for the pictures: Search first for the famous star-picture of Ursa Major, otherwise known as the "Great Bear" and "Big Dipper." The "Dipper," composed of seven fairly bright stars hangs down the sky, open to the west, and you should have no difficulty in seeing the figure.

The stars on the diagram bear the Greek letter star names. You will find the Greek alphabet in the back of the book. It is well to learn this for it will aid you in studying the star-pictures, and enable you to identify stars that have not been otherwise named.

The stars Alpha and Beta in the "Big Dipper" are called "the Pointers," because a line drawn from the latter through the former and extended guides you always to the most celebrated of all stars, Polaris, the North Star. Always remember this rule, and wherever you are you will always have a faithful guide on every clear night.

To the right of the Pole, at about the same distance from it as the "Big Dipper," you will see five stars about as bright as Polaris that form a widely

extended letter "W"; this is the star-picture of Cassiopeia, "the Lady in the Chair."

Above Cassiopeia, and to the right of Polaris, is a house-shaped group of five faint stars that mark the star-picture of Cepheus, "the King." It is not easy to trace out this picture for the stars are dim, and you need a clear moonless night, but the diagram will assist you to locate the figure.

Polaris is in the tip of the tail of the "Little Bear" or Ursa Minor, and at the end of the handle of the "Little Dipper," whichever you choose to call it. The stars of this picture are also faint, with the exception of Beta and Gamma, which are called "the Guardians of the Pole."

Curving about between the Bears, as traced out on the diagram, you will see the huge figure of Draco, the Dragon. It is a long extended serpentine figure that is a little difficult to trace out, but the diagram will assist you. If you like puzzles, and most people do, you will find it great fun to search for these somewhat obscure pictures.

You now know the famous star-pictures that we see all the year round in the northern sky. They assume different positions as they circle the Pole but their stars always remain in their same relative positions.

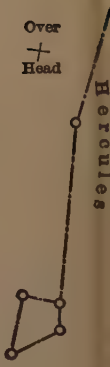
A diagram of the positions assumed by the "Big Dipper" at different seasons is given in the first part of the book, and under the description of the star-pictures of autumn you will find many interesting stories concerning the circumpolar star-pictures.

LYRA
THE LYRE

Draco

2
Deneb
α
Cygnus
3
Albireo
β

4
η
4
ε
1
Aladfar
μ
Vega
α
4
ζ
4
δ
LYRA
3
Sheliak, a variable
β
3
Sulafat
γ


Over
Head
Hercules

LYRA

LYRA (lī′-ra)—THE LYRE. (Face East.)

The Lyre whose strings give music audible
To holy ears.

LOWELL.

WHILE we have been tracing out the northern star-pictures, we have been struck with the beauty of a dazzling bluish star almost overhead in the early evening sky.

This is the charming star Vega, in the star-picture of Lyra the Lyre. An imaginary line drawn from Polaris through the head of the Dragon points to Vega. The little picture that it presides over contains five other fairly bright stars close to it which form an attractive four-sided figure, which is outlined in the sketch.

Mathematicians call such a figure a parallelogram, that is, a four-sided figure whose opposite sides are parallel and equal.

The Lyre rises in the northeast in the early evening about May 1st, and from then until August it climbs the eastern sky higher each succeeding night until September 1st, when, at 8 P.M., it crowns the heavens and is directly overhead.

Vega has been called "the Arc light of the Sky," because of the bluish tint of its resplendent rays.

It is the brightest star in the northern skies, although only slightly brighter than Capella and Arcturus.

Capella you may see setting low in the northwest in the early evening about the middle of June. If you are out studying the stars about this time, you will have a chance to compare the light and color of Vega and Capella.

To obtain the correct view of the star-picture of the Lyre at this season, turn the book to the right, and you will see that the four stars forming the parallelogram are below and to the right of Vega. In the late autumn and winter when Lyra is setting in the northwest in the early evening, the parallelogram is to the left and above Vega.

Vega is visible at some time of the night every clear night in the year, and as it reigns overhead all summer it may be regarded as the Queen of the summer skies. Its bluish-white hue suggests a diamond, and it is a fairly young star. The spectroscope reveals that it is a gigantic globe of flaming hydrogen gas of intense heat. Vega is thirty-four light-years away from us. This means that it takes the light from Vega thirty-four years to reach us traveling at the rate of 186,000 miles a second.

If our sun, which is so bright that we cannot look at it directly, were placed out in space at the same distance that Vega is from us, it would appear as a tiny star just visible to the naked eye, very much of the same brightness as the two faint stars close to Vega. This gives you some idea of the enormous distance that separates us from this beautiful star

Vega is a particularly interesting star to us, as the earth and all the planets are being dragged along by the sun toward Vega at the rate of twelve miles a second. Vega is also speeding to meet us at the rate of ten miles a second, yet it is so distant from us that half a million years must elapse before our sun and Vega pass each other.

Fourteen thousand years ago Vega was the Pole star, and eleven thousand five hundred years from now it will again occupy that position. This is due to a peculiar shifting of the earth's axis called "precession."

The Arabs called Vega "the Falling Vulture." The Chinese and Japanese name for it is "the Spinning Maiden," and it has also been called "the Harp Star." Seven thousand years before the birth of Christ Vega was worshipped in Egypt. When you gaze at this blazing star think of the wonder and awe with which it was regarded by the ancient Egyptians and the worship they paid it.

For its size Lyra is the most interesting star-picture of them all, for, besides containing the brilliant Vega, and marking the goal of our sun, it also contains a noted quadruple star, a celebrated variable star, and the famous "Ring Nebula."

The quadruple star is Epsilon, the faint star at the left and below Vega at this time of the year. If you have sharp eyes you will see that it is a double star, the two stars appearing to be very close together. If you cannot see the double look at it with your opera glass, which you should always have at hand

when you are out studying the stars, for such a glass reveals a great deal that is interesting and beautiful in Starland. A small telescope reveals that each of the two stars of the double are in turn double, and here, where there is at first glance one star, there are really four.

A variable star is one in which we note a change and fluctuation in its light. We are accustomed to think that the stars always shine with the same brightness, just as the fixed lights in the lighthouses along the coast do; but, just as some of the coast lights are what are called revolving lights that shine brilliantly only at certain intervals, so many of the stars change their light and are sometimes bright and sometimes faint. Astronomers do not know the reason for these light changes, but the problem is being investigated by many observers, and we hope in time to solve it.

The star Beta in Lyra is a noted variable star, and as it is plainly visible to the naked eye you can observe its light changes, but you must not look for any great change. A text book on astronomy will inform you of the amount of the change if you wish to study its variations.

Between Gamma and Beta is the noted "Ring Nebula," which is only visible in a telescope, and it takes a large one to reveal its beauty. The ring resembles a hazy smoke ring and in the centre of it is a faint star presenting a charming appearance.

A nebula is a diffused mass of gaseous matter, and there are thousands of these objects in the sky,

but for the most part they are only visible in telescopes.

According to the ancient legend the star-picture of Lyra, or the Harp, represents the instrument which Apollo or Mercury gave to Orpheus. Orpheus was such a skillful player of the harp that all nature was thrilled and charmed with his playing; it is said that rivers ceased to flow, the wild beasts became tame, and even the mountains, rocks and trees listened with pleasure to the magic music of his harp.

For Orpheus' lute was strung with poet's sinews;
Whose golden touch could soften steel and stones,
Make tigers tame, and huge leviathans
Forsake unsounded deeps to dance on sands.

Orpheus married the beautiful nymph Eurydice, but, sad to relate, the bite of a serpent caused her death. Her heart-broken husband resolved to recover her even if he perished himself in the attempt, and taking his harp, he entered the mysterious abode of departed spirits presided over by Pluto.

Pluto was completely charmed with the magic of his playing, and agreed to release Eurydice on the condition that, as they emerged from the gates of death, Orpheus was not to look backwards.

To this condition Orpheus agreed, but, just as he was about to reach the world of the living again, his desire to see Eurydice who was following him overcame his resolve not to look back. At his glance

Eurydice vanished, and he was never able thereafter to gain admission to her abode.

Grief-stricken, Orpheus wandered about from place to place, forsaking all companionship, and, it is said, that the Thracian women were so incensed at his indifference to them that they tore his body to pieces and threw his head into the river Hebrus; yet even dismembered, as it was, from his body, the head of Orpheus still uttered the name "Eurydice."

After his death he was buried with the highest honors at the foot of Mount Olympus, and Jupiter placed his harp amid the stars where it now mingles its sweet strains with the music of the spheres.

There is a plaintive charm about this legend that seems to blend appropriately with the beautiful stars that form the celebrated star-picture of the Lyre and on a mild night in summer, when all the world seems at peace, and in an attitude of listening in imagination, you, too, may sense the strains of distant music, divinely sweet as you gaze at the Lyre, and think of the lovers Orpheus and Eurydice.

In very ancient times Lyra was regarded as one of the three birds opposed to Hercules, while the Phœnicians regarded it as a tortoise. In Bohemia Lyra was called the "Fiddle in the Sky," and the ancient Britons knew it as "King Arthur's Harp."

Lyra marks the place in the sky where, about April 20th, we may expect to see meteors (falling or shooting stars as they are incorrectly called) darting across the heavens. These are small particles of metallic substances attracted toward the earth much

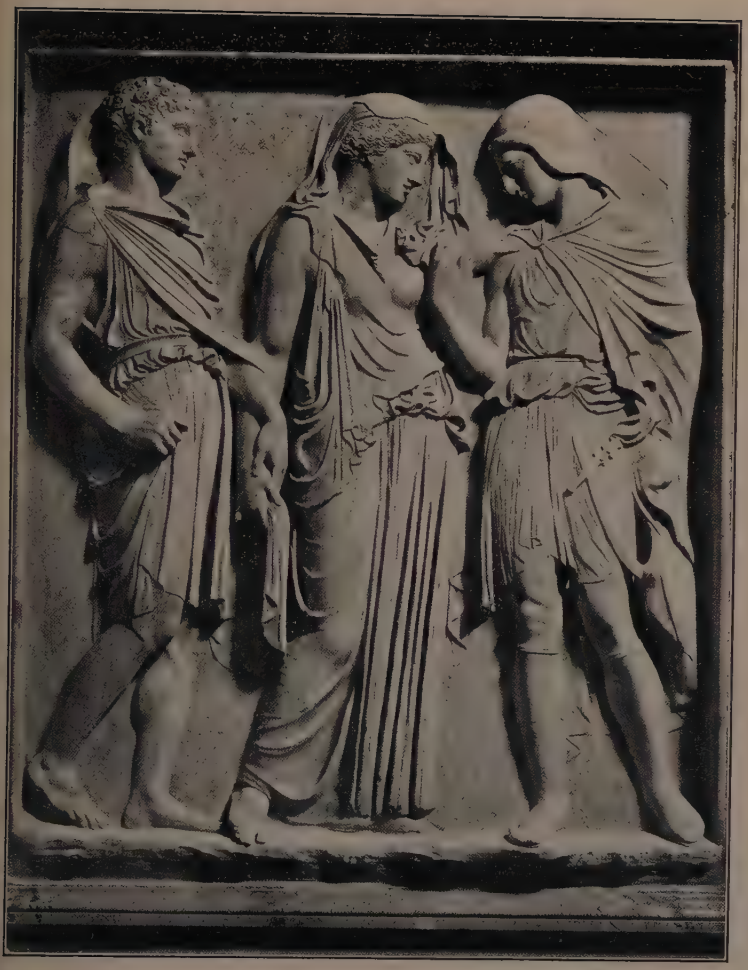
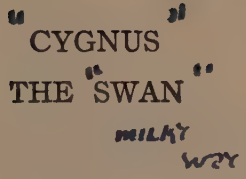
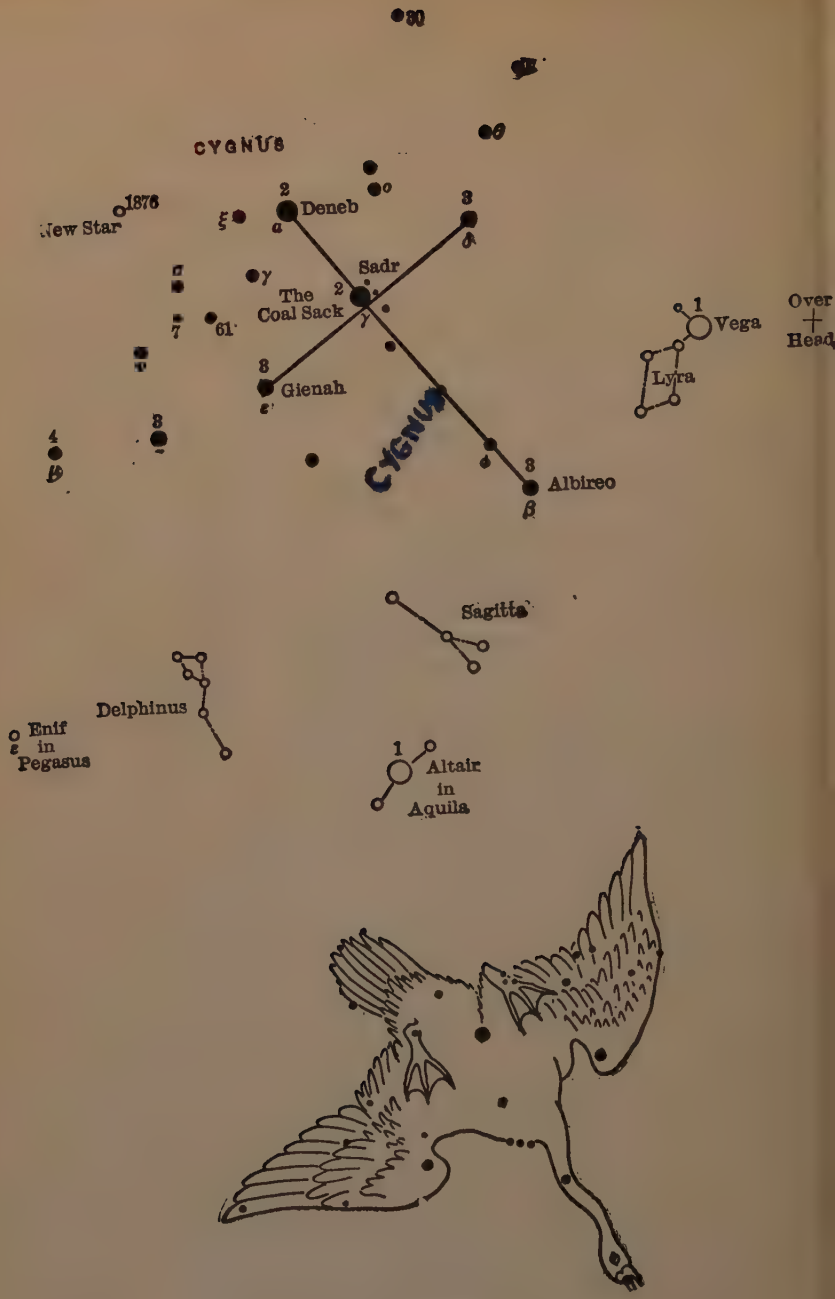


Photo by Anderson

Orpheus and Eurydice
Villa Albani, Rome

as moths are attracted by a flame. They encounter our earth's atmosphere, the friction sets them afire, and they dart toward the earth, leaving a trail of fire behind them. Most of the meteors are entirely burned up before they reach the earth, but occasionally a large one is not entirely consumed and its remaining mass buries itself in the ground. Many specimens of meteors have been collected and are on exhibition in our best museums. Meteors are supposed to be the scattered parts of old comets. The shower of meteors that radiate from Lyra are called "the Lyrids," their flight is very swift and you must be sure to look for them.


CYGNUS
THE SWAN
MILKY
WAY


CYGNUS
1876
New Star
Deneb
Sadr
The
Coal Sack
61
Gienah
Albireo
CYGNUS
Vega
Lyra
Over
Head
Sagitta
Delphinus
Enif
in
Pegasus
Altair
in
Aquila

CYGNUS

CYGNUS (sig'-nus)—THE SWAN, OR THE NORTHERN CROSS. (Face Northeast.)

Yonder goes Cygnus the Swan, flying southward.

BELOW the Lyre, in the eastern sky in the early evening about July 1st, you will see the famous Northern Cross rising sideways.

A glance at the sketch shows you the location of its brightest star Deneb, below and to the left, that is, to the north of Vega. An imaginary line drawn from the star Delta in Hercules through Vega, extended an equal distance, points out Deneb, if you are in doubt of its identity. Deneb marks the top of the Cross. The Northern Cross is not as brilliant a figure as the celebrated Southern Cross, but its stars form a more perfect cross than its counterpart in the southern hemisphere.

Cygnus lies in the jeweled region of the Milky Way, that cloud-like band that girdles the sky. Its cloud-like misty appearance is due to the fact that it is composed of a myriad suns that are apparently so close set that they give the appearance of a continuous band of light, or a river of mist that winds its way through the purple fields of night.

Sweep over this region with your opera glass, and you will exclaim with pleasure at the many beautiful

sights the glass reveals. See the clusters and star streams, the double and multiple stars of various hue. It is like gazing at a display of rare jewels spread out on a cloak of black velvet, and the sparkling array and beautiful coloring of the stars is a fascinating and glorious sight.

In the region included in the triangle formed by the stars Alpha, Gamma, and Epsilon, you will see a place devoid of stars, a sort of window in the Milky Way, through which we seem to peer into the depths of unfathomable space.

This is one of the famous "Coal Sacks" of the sky, and at present astronomers are much mystified over their appearance. There is a theory that these may not be open spaces at all, but dark bodies that lie between us and the background of the star-strewn Milky Way. It is certainly an interesting thought that there are objects in the heavens that are not luminous. We know that there are many dark stars, suns which, like burned out embers from a furnace, have lost their heat and brightness, but the thought that there are other dark and irregularly shaped bodies in the heavens is a novel one.

It is most fitting that the Cross should be seen to splendid advantage Christmas eve, when, at nine o'clock, it stands upright, transfixed seemingly to the western sky by golden nails, a beautiful symbol of the Christian faith, proclaiming the coming of the Saviour of Mankind.

Deneb is an Arab star-name meaning "the Tail," and it marks the tail of the Swan. Another name for

the star is "Arided" which means "the hindmost." It is a white star and its distance from us cannot be measured, so that it must be a sun of immense size. It ranks about twentieth in the order of star brightness.

Not far from Deneb you will note on the sketch a star marked 61. This star was for a long time thought to be our nearest neighbor; now it ranks fifth in the list of the nearest stars to us. It is a double star and just visible to the naked eye.

Beta Cygni, or Albireo, is one of the most beautiful colored double stars in the heavens. The twin suns, a blue and a gold in color, present a charming sight in a small telescope.

This whole region of the sky is a veritable mine of pleasure and interest to the possessor of a telescope and even an opera glass reveals many charming sights.

There are various legends to account for this star-picture. Some suppose that it represents Orpheus, who was changed at his death into a swan, and placed near his magic harp in the sky.

Another story is that this is the Swan into which Jupiter changed himself when, unknown, he visited Leda, wife of Tyndarus, the King of Sparta.

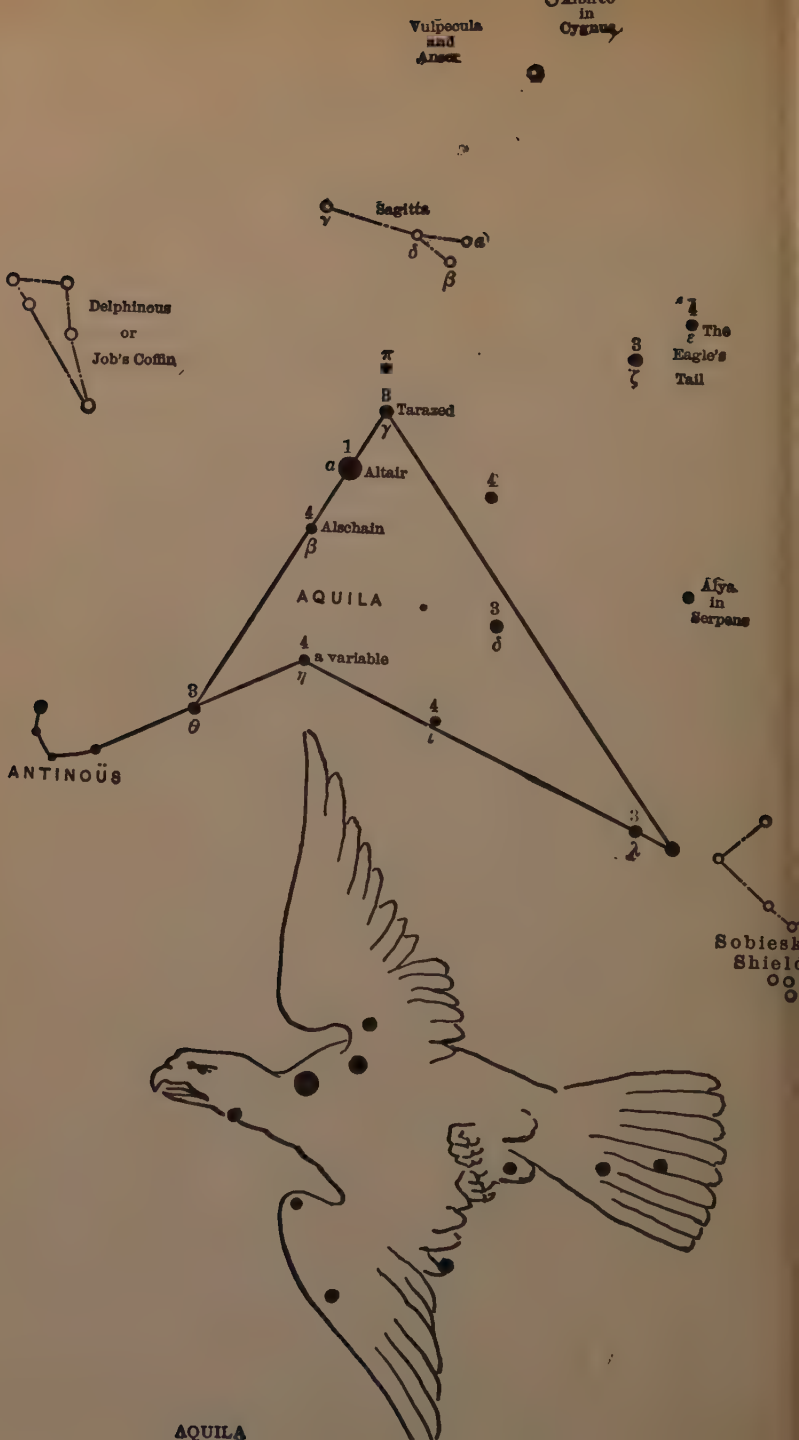
Again we are told that these stars represent Cygnus, son of the King of the Ligurians, and a relative of Phaëthon's, concerning whom you will read in the description of the star-picture Eridanus, a winter star-picture. Cygnus was so disconsolate over the death of Phaëthon that Apollo took pity on him,

turned him into a Swan, and placed him among the stars.

It is also said that the Swan represents Cygnus, a son of Neptune, whom no one could harm with blows or missiles. Achilles tried in vain to inflict a mortal wound on him, and finally succeeded in smothering him to death. As Achilles was about to rob the unfortunate Cygnus of his armor, the gods changed him into a Swan and placed him in the sky.

The Arabs knew Cygnus as "the Flying Eagle," and the Greeks called it "the Bird." This region of the sky seems to abound in birds, just as another portion of the sky seems to contain fishes and aquatic creatures. Here we have in addition to the Swan, Lyra, which some of the ancients called "the Swooping Eagle," or "Falling Vulture," Aquila the Eagle, a star-picture that will be described in the next chapter.

AQUILA
THE EAGLE


Vulpecula and Anser
Sagitta
Delphinous or Job's Coffin
The Eagle's Tail
Tarazed
Altair
Alschain
AQUILA
Áfya in Serpens
a variable
ANTINOÜS
Sobiesk Shiel
AQUILA

AQUILA (ak′-wi-lă)—THE EAGLE. (Face Southeast.)

Divides the ether with her ardent wing
Beneath the Swan.

THE diagram of the summer star-pictures shows you clearly the location of the star-picture of Aquila, the Eagle.

You will note that an imaginary line, drawn from Vega through the parallelogram in Lyra, directs you to the Eagle. Altair, the bright star in Aquila, is at the apex of a triangle formed by joining with imaginary lines the stars Vega, Deneb, and Altair.

You can hardly mistake Altair, the beautiful star which in mid-summer sparkles half-way up the southeastern sky. It has two attendant stars, one above and one below it, and the three stars in line form a striking group known as "the family of Aquila."

The stars of the Eagle joined together by lines in the sketch form the figure of a rude arrowhead.

The little picture of Antinoüs (an-tin′-o-us) is linked with the larger star-picture of Aquila because the ancient legend closely associates the two pictures.

Altair rises a little north of the exact eastern point on the horizon in the early evening about the middle

of June, and sets in the early evening about the middle of December, so that all summer long it graces the sky and you will have the pleasure of seeing it.

Mrs. Martin in her attractive book, "The Friendly Stars," thus beautifully alludes to the advent of Altair in the sky:

"There comes a soft June evening with its lovely twilight that begins with the song of the wood-thrush and ends with the strenuous admonitions of the whip-poor-will; and, almost as if it were an impulse of Nature, one walks to the eastern end of the porch and looks for Altair."

There is nothing about the arrival of Altair in the sky in the spring of the year that is spectacular, as is the case with the advent of those glorious suns Arcturus and Vega, but she steals into the sky timidly and seems to tremble there as if half afraid, and shyly reveals her beauty to us before we are scarcely aware of her presence.

Altair is pale yellow in color, the eleventh in order of star brightness, and sixth in the list of the nearest stars, being 13.7 light-years distant.

The star Eta in Aquila is a remarkable variable star, and as it is fairly bright you can note its light changes which are exceedingly interesting.

It remains at its brightest for forty hours, then gradually grows fainter and fainter for sixty-six hours. It remains stationary in brightness for thirty hours, then slowly regains its original brightness. Its total variation in light is a full magnitude.

If you are going to study the stars you should have an idea of the brightness of the stars of different magnitudes. The term "magnitude" refers to the light of the stars, not their size or mass. Turn to the chapter that describes the star-picture of Ursa Minor, the "Little Bear." Consult the sketch and you will see that the figure contains stars of the second, third, fourth and fifth magnitude. Study these stars attentively and you will see that their difference in magnitude is equal in each case; that is, that the third magnitude star is two and one-half times fainter than the second magnitude star Polaris, and two and one-half-times brighter than the fourth magnitude star, and the difference in the magnitudes of all the stars is measured in the same ratio.

We cannot see stars fainter than the sixth magnitude. The large telescopes photograph stars down to the twentieth magnitude. Altair is a first magnitude star and two and one-half times fainter than Polaris, the standard second magnitude star by which all the other stars are measured.

This information, although a little technical, is given for the reason that at any time a new star may appear and you may be the fortunate discoverer. You will thus have knowledge that will enable you to measure its brightness, and you should report your discovery immediately to the nearest Observatory.

Antinoüs, a native of Bithynia, was a youth of great beauty. He was a great favorite of the Emperor Hadrian, and believing that the Emperor's life could be prolonged by his death, he plunged into the

river Nile and was drowned. The Emperor was so touched by this act of devotion and self-sacrifice that he erected a temple to his memory, founded the great city of Antinoöpolis on the bank of the Nile in his honor, and further immortalized him by giving his name to some of the faint stars in the star-picture of Aquila.

There are various stories to account for the ancient star-picture of Aquila. In Greece, Aquila was regarded as the Bird of Zeus, and is represented as bearing aloft in his talons a beautiful boy whose name was Ganymede. It appears that Jupiter was so struck with his beauty that he wished him to be his cup bearer, and sent the Eagle to seize and carry him up to heaven. Some say that Jupiter himself impersonated the Eagle on this mission.

Aquila and Lyra are linked together in the curious and attractive Chinese legend of the Spinning Damsel and the Magpie Bridge, a myth current in Korea also. It is as follows:

A cowherd fell in love with the spinning damsel. Her father in anger banished them both to the sky where the cowherd became Alpha, Beta, and Gamma Aquilæ, and the spinning damsel the star-picture Lyra.

The father decreed that they should meet once a year, if they could contrive to cross the river (the Milky Way). This they were enabled to do by their friends, the magpies, who still once a year, the seventh night of the seventh moon, congregate at the crossing point, and form a bridge for them to

pass over. In Korea, if a magpie is seen about its usual haunts at this time the children stone it for shirking its duty. According to Lafcadio Hearn, this legend is the basis of the Japanese festival called "Tanabata." The sky lovers here are known as "the Herdsman and the Weaver," and when the meeting occurs it is said that the lover stars burn with five different colors. If rain falls at the time set for the crossing, the meeting fails to occur. For this reason rain on the Tanabata night is called the "rain of tears."

The Turks called Aquila "the Hunting Eagle," and all through the ages it has been known as a bird of prey.

On the night of June 8, 1918, a wonderful new star flashed out in this star-picture. It was brighter than Altair and rivaled Vega in splendor, being the brightest Nova that has appeared in three hundred years. The star waned rapidly, and at this writing is a star of the ninth magnitude.

DELPHINUS
THE DOLPHIN
(JOB'S COFFIN)

Vega
in
Lyra
Cygnus
Vulpecular
and
Anser
Albireo
DELPHINUS
Rotanev
Sualocin
Deneb
Sagitta
Altair
in
Aquila

DELPHINUS

DELPHINUS (del-fi′-nus)—THE DOLPHIN OR JOB'S COFFIN. (Face East.)

The Dolphin small to sight floats
O'er the Goat.

ARATOS.

THERE is an extremely attractive little star-picture called Delphinus the Dolphin, or Job's Coffin, in this region of the sky.

The diagram shows its location between the Swan and the Eagle. An imaginary line, drawn from the star Lamda to Beta in Aquila and extended, points it out.

The stars in Delphinus are faint, four of them form a diamond-shaped figure, and if the night is clear you should see this figure without difficulty. It is a very pretty sight in an opera glass.

There is a story that the Dolphin was placed among the stars by Neptune, because it was the Dolphin that persuaded the goddess Amphritite, who had vowed that she would never marry, to become the wife of Neptune; but the best story we have concerning the Dolphin associates it with Arion, who was a native of Lesbos, and far famed as a poet and musician.

It appears that, having achieved great fame and

riches abroad, Arion embarked on a ship to return home, but the sailors, being envious of his great wealth, plotted to kill him and rob him of his property.

Arion became aware of this plot, and begged the sailors to allow him to play upon his lute before he was put to death. The sailors agreed to this, but no sooner had he started to play than the sweet strains attracted a great number of Dolphins around the ship.

Arion suddenly leaped overboard among them and, it is said, that one of the pretty creatures carried him on his back safely to the shore where he hastened to the court of Periander, denounced the sailors, and when their ship came into port they were all killed, which was good enough for them.

> But (past belief) a dolphin's arched back
> Preserved Arion from his destined wrack;
> Secure he sits, and with harmonious strains
> Requites his bearer for his friendly pains.

Again the dolphins performed a worthy service in the case of the famous poet, Hesiod, who was murdered. His body was thrown into the sea, but a dolphin conveyed it to the shore, and thus the crime was discovered. The murderers were tracked down and drowned as a fitting punishment for their crime.

Taras, said to be the founder of the City of Tarentum, was saved from shipwreck by a dolphin, and in memory of his preserver the figure of a dolphin was stamped on one of the coins of the time.

Photo by Brogi

Cupid and Dolphin
National Museum, Naples

Thus we see that the dolphins were distinguished by their good deeds, and rightly deserve a place of honor among the stars.

Three of the stars in the Dolphin are named. Two of these names are very strange, but if you spell them backwards they read Nicholaus Venator which is the Latin name of the astronomer who assisted the famous astronomer Piazzi.

In Greece, the Dolphin was regarded as the Sacred Fish, the sky emblem of philanthropy. The Arabs called this star-picture the "Riding Camel," and certain sects of the Greek Church thought that these stars represented the Cross of Jesus Christ, placed in the sky after his crucifixion. The Chinese knew this figure as a Gourd.

No one knows how the title "Job's Coffin" came to be applied to this star-picture, but the title is known to many who know few, if any, of the more famous star-pictures.

SAGITTA
THE ARROW

SAGITTA—THE ARROW

THERE is another small star-picture near Delphinus that is worth knowing. It is called "Sagitta," the Arrow. It is situated in the Milky Way about midway between Altair and the star Beta in Cygnus. It bears a close resemblance to an arrow, and the picture is a very ancient one.

According to one authority this is the arrow with which Apollo killed the Cyclops, the great one-eyed giants that at one time were said to dwell upon the earth. Apollo had revenge on them, because they are said to have furnished Jupiter with the thunderbolts to kill Æsculapius.

We are also told that this was one of the arrows used by Hercules to kill the hideous vulture. It appears that Jupiter had caused Prometheus to be chained to a rock on the summit of Mount Caucasus, where he was attacked by a fierce vulture that was gnawing at his vitals, when Hercules drew his bow and his unerring shaft killed the wicked bird.

Sagitta has also been regarded as Cupid's arrow, and this, it seems to me, is an attractive name for it, and when we gaze upon this starry arrow we should think of this pretty fancy, and of the good St. Valentine.

OPHIUCHUS AND SERPENS

THE SERPENT BEARER AND THE SERPENT

Corona Borealis
Gemma
Hercules
Ras Algethi
Ras Alhague
Altair in Aquila
Alya
Bull of Poniatowskia
Chelel
OPHIUCHUS
SERPENS in dot and dash
Marfik
Unuk al Hay
Yed
Sobieski's Shield
Sabik
1604
Sagittarius
Antares in Scorpio

OPHIUCHUS

OPHIUCHUS (of-i-ū′-kus) — THE SERPENT BEARER. SERPENS, THE SERPENT. (Face South.)

Thee, Serpentarious, we behold distinct,
With seventy-four refulgent stars.

EUDOSIA.

A GREAT giant in the sky now claims our attention. His name is Ophiuchus, or Serpentarius, because, as you will see by the picture, he has fast hold of a gigantic serpent that writhes across the sky, with its forked tongue darting at the beautiful Northern Crown, the circlet of stars that lies between Hercules and Boötes.

We have here two star-pictures combined in this figure. The giants, Hercules and Ophiuchus, lie with their heads almost bumping each other, facing in opposite directions. The bright star Ras Alhague, which means "the Head of the Serpent Charmer," marks the giant's head, while the star Ras Algethi is located in the head of Hercules. Two pairs of stars adorn the shoulders of Ophiuchus, who appears to be trampling underfoot the Scorpion in spite of the fact that his feet are bare.

In the early evening in mid-summer Ophiuchus is directly south and splendidly placed for observation.

An "X" shaped group of stars mark the head of the Serpent just below the Crown, and then you can trace the fairly bright stars downward and to the left across the southern sky until you come to the star Theta, which marks the tip of the Serpent's tail. This star lies on a line between Altair and the pair of stars in the right shoulder of Ophiuchus.

The little group of four faint stars, a little to the left of Beta and Gamma in Ophiuchus, is known as "the Bull of Poniatowskia," the Polish Bull, a modern star-picture no longer recognized by astronomers.

The star Alpha in the Serpent which bears the curious Arab name "Unuk al Hay," lies in the heart of the Serpent.

Ophiuchus is a very old star-picture known to the ancients fully twelve hundred years before the birth of Christ.

According to the Greek legend, Ophiuchus represents the renowned physician Æsculapius, the inventor and god of medicine, with whose worship serpents were always associated.

Æsculapius was educated either by his father Apollo or Chiron the Centaur, and is said to have been such a skillful physician that he could even restore the dead to life. This extraordinary power so alarmed Pluto, who reigned over the region of the dead, that he persuaded Zeus to remove Æsculapius from the earth and place him among the stars.

In the middle ages Ophiuchus was sometimes regarded as representing Moses with the Brazen

Photo by Anderson

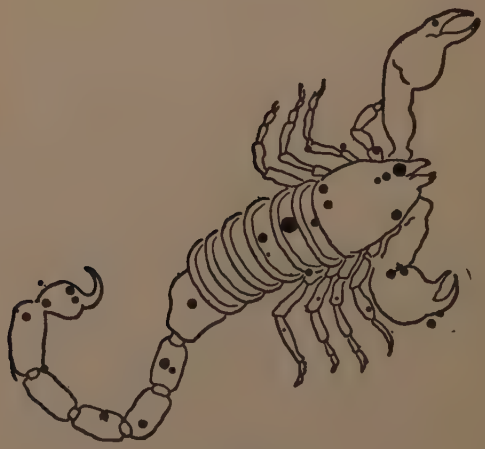
Laocoōn
Museum of Vatican, Rome

Serpent. It is also claimed that Ophiuchus represents Laocoön, a son of Antenor. At the famous siege of Troy it is said that he thrust a spear through the celebrated wooden horse, and to punish him for this, two sea serpents attacked and strangled in their folds Laocoön and his two sons. There is a noted piece of statuary in the Vatican at Rome depicting this tragedy.

The southern portion of this star-picture is worth sweeping over with your opera glass; near the star Theta you will see another of the dark gaps in the Milky Way known as "Coal Sacks," that are a source of great interest to astronomers.

SCORPIUS
THE SCORPION

Ophiuchus
Libra
Jabbah
Graffias
80 M.
Dschubba
Antares
6 M.
SCORPIO
4 M.
7 M.
Sagittarius
Shaula
Lesuth
Double
Double
Sargas
Lupus



SCORPIUS

SCORPIUS (skôr′-pi-us)—THE SCORPION.
(Face South.)

There is a place above where Scorpio bent
In tail and arms surround a vast extent
In a wide circuit of the heavens he shines
And fills the place of two celestial signs.

OVID.

DIRECTLY below Ophiuchus, in the southern sky in the early evenings of mid-summer, you will see a line of stars that curve up to the left like a fish-hook. One of these stars is very bright and of a fiery red hue. It is the star Antares in the heart of the Scorpion.

The figure traced out by the stars, as shown in the sketch, does not look unlike the creature it represents. In fact the curved tail with which the Scorpion stings its victims appears ready for action and about to dart at the exposed foot of Ophiuchus, the giant that treads upon the creature.

Scorpius is one of the star-pictures of the Zodiac, which is the imaginary pathway in the sky traversed by the Sun, Moon, and Planets. It is divided into twelve equal parts, in each of which is a star-picture.

You should memorize the rhyme at the end of the book which names the star-pictures of the Zodiac in

the order in which they appear in the sky. This will be of great assistance when you come to study the Planets which will be described in a later chapter.

An imaginary line drawn from Ras Alhague in Ophiuchus through the star Zeta, extended a short distance, points out the three stars that mark the Scorpion's head.

The ruddy Antares in the Scorpion's heart is one of the most interesting stars in the sky. Its name is Greek, meaning "a rival of Mars," which, as we will see later, is the name of a Planet noted for its red color.

The Arabs knew this star as "the Scorpion's Heart," and it was one of the four "Royal Stars" of Persia 3000 B.C. In China it was known in ancient times as "the Fire Star," and thousands of years before the birth of Christ Antares was worshipped in Egypt.

Antares is a double star of great beauty. Concealed in its flaming red heart is an emerald green star which can be seen in a telescope of moderate size. Antares rises in the southeast at sunset on the first day of June, and is due south at 9 P.M. on July 11th. It is a young star, a giant in size, and the seventeenth in order of brightness, and at the enormous distance from us of three hundred and eighty light-years.

The stars from Mu to Upsilon were known to the Polynesian islanders as "the Fish-hook of Maui," the hook with which their god Maui drew up from the depths of the sea the great island called "Tongareva."

To the north and east of Shaula and Lesuth, the twin stars that mark the uplifted sting of the Scorpion, look in your opera glass for the beautiful star clusters marked 6 M. and 7 M. on the sketch. They are very beautiful objects. The figures and letters used here and in many of the sketches refer to the cluster numbers as given in Messier's Catalogue of the star clusters discovered by him.

The old stories concerning the Scorpion connect it with Orion, the Giant Hunter of the skies, whose star-picture is the feature of the night sky of winter.

The Scorpion was said to have sprung out of the earth at the command of the goddess Juno, and biting the foot of Orion caused his death. Juno in this way punished the hero for his vanity, for he had boasted that he could conquer every creature on earth. The insignificant Scorpion destroyed the Giant and now forever teaches by its presence in the sky the folly of vain boasting.

The star-pictures of Orion and Scorpius are so placed that they never appear in the sky at the same time. Aratos thus expresses it:

> When the Scorpion comes
> Orion flees to the utmost end of earth.

The Scorpion is also associated with the story of the runaway accident in which Phaëthon came to grief, which you will read about in the story of the star-picture of Eridanus in the winter group. It seems that, as the runaway steeds of the sun went careering

across the sky bearing the terrified Phaëthon, the Scorpion stung the horses to madness and they plunged wildly, overturning the chariot, and Phaëthon was dashed to the earth.

This region of the sky is famous as marking the place where many brilliant new stars have appeared. Learn to know all the stars in the picture well, and look at the figure whenever you are out on a clear summer's night, and perhaps you, too, will win fame as the discoverer of a Nova. Who knows?

SAGITTARIUS
THE ARCHER

SAGITTARIUS

SAGITTARIUS (saj-i-tā′-ri-us)—The ARCHER.
(Face Southeast.)

Midst golden stars he stands refulgent now
And thrusts the Scorpion with his bended bow.
OVID.

CLOSELY associated with the Scorpion in the sky, and east of it in the Zodiac, is the star-picture of Sagittarius, the Archer.

Low down in the southeastern sky to the left of the Scorpion you will see his "golden stars," and in the sketch you will note that the Archer with bow stretched is aiming a shaft at the heart of the Scorpion, the creature that humbled the mighty Orion.

The stars forming the Bow, three in number, are arranged much as the stars in the head of the Scorpion appear, but they have more space between them, and the star Gamma to the right of the Bow marks the tip of the arrow that is ever threatening the Scorpion.

An imaginary line drawn from the star Pi in Scorpius to Antares, prolonged about four times its length, points out the famous "Milk Dipper" in Sagittarius, which takes its name from the fact that the figure lies in the Milky Way. The "Dipper" is

formed by the stars Phi, Sigma, Tau, and Zeta, and its handle by the stars Lamda and Phi. The Milk Dipper is sometimes called "the Hobby Horse of Sagittarius." In the star-picture it is upside down and thus makes a poor receptacle.

You will note on the sketch the location of two star clusters that are beautiful sights in an opera glass.

A little below the cluster 8 M. you will note a *. This marks the place which the sun occupies December 21st of each year, the most southerly point in the sky reached by the sun.

If you wish an additional guide to direct you to this star-picture, draw an imaginary line from Deneb in the Swan through Altair in the Eagle, this when extended southwards points out the star-picture of Sagittarius.

Sagittarius contains several of the famous "Coal Sacks" in the Milky Way, the dark spots in which no stars appear. They are located near the stars Gamma, Delta, and Lamda.

Below the Milk Dipper is a ring-shaped group of stars called Corona Australis, "the Southern Crown." You cannot see this attractive star-picture unless you have a very clear night and an unobstructed view of the southern horizon.

According to the Greek legend, Sagittarius represents the celebrated Centaur, Chiron, a figure half man, half horse. He was the son of Saturn and Philyra, and is said to have changed himself into a horse in order to escape from his jealous wife, Rhea.

Chiron was famous in his day for his knowledge of medicine, music, and shooting, and taught mankind the use of plants for medicinal purposes. He was a celebrated instructor and his pupils numbered among others such famous personages as Apollo, Hercules, Æsculapius, Achilles, Jason, and Æneas.

According to some authorities, Chiron was killed by Hercules for insulting his wife, but others say that he came to his death from the scratch of one of the poisoned arrows that Hercules carried, arrows that you recall were steeped in the blood of the Lernean monster that Hercules killed. He suffered such agony from the wound that Jupiter took pity on him and placed him among the stars.

The Centaurs were, it is said, an ancient race that inhabited Mt. Pelion in Thessaly, and Chiron was the most famous of them all. He is sometimes called "the Bull Killer," and the meaning of this name is that when the stars of Sagittarius rise in the east they seem to drive those of Taurus, the Bull, below the western horizon out of sight.

LIBRA
THE SCALES

Serpens
Ophiuchus
Zubeneschamali
β
2
LIBRA
3
γ
Zubenelgenubi
α
2
3
4
Scorpio
1
Antares

LIBRA

LIBRA (lī'-bra)—THE SCALES. (Face Southwest.)

Libra weighs in equal scales the year.
THOMSON.

PASSING to the right or west of the Scorpion in the southwestern sky in the early evening in mid-summer, we come to the star-picture of Libra, the Scales. It is situated in the Zodiac about midway between Antares and the beautiful white star Spica in the Virgin, which you will see well down the western sky.

Libra is not a bright or a very interesting picture. Its stars form a four-sided figure, as you will note in the sketch. Two of the stars in this figure, Alpha and Beta, are about as bright as the stars in the head of the Scorpion. Alpha is a wide double star, and Beta is noted for its color, a pale emerald, an unusual star color.

In ancient times these stars represented the claws of the Scorpion. The title "Libra" we owe to the Romans. The picture appears to have originated in the time of Julius Cæsar, and in his day it was regarded as the balance of Æstræa, the goddess of Justice, upon which the fate of mortals was weighed.

It is supposed that the figure of the balance in this region of the sky refers to the fact that, when the

sun is in this picture, the days and nights are of equal length.

The tillers of the soil, according to Virgil, regarded these stars as indicating the time of year for sowing their winter grain.

> But when Æstræa's balance hung on high,
> Betwixt the nights and days divides the sky,
> Then yoke your oxen, sow your winter grain,
> Till cold December comes with drenching rain.

According to the Greek legend, the star-picture of Libra represents Mochus, the inventor of weights and measures, and thus perpetuates his memory.

The ancient Hebrews and the early inhabitants of India and China regarded these stars as representing a celestial balance.

THE MILKY WAY

THE MILKY WAY

A way there is in heaven's extended plain,
Which, when the skies are clear, is seen below,
And mortals by the name of Milky, know;
The groundwork is of stars.

MANILIUS.

ON any clear night during the year, when the moon is absent from the sky, you will see a band of light stretching across the heavens that resembles filmy white clouds, or the mists rising from a winding stream.

This is the famous Milky Way, and a telescope reveals that the cloudy appearance is caused by the presence of a multitude of stars that are seemingly so close together that the naked eye cannot separate them.

This shining pathway in the sky is seen to best advantage during the months of July, August, September, and October. To trace out the Milky Way in the winter season, start near the head of Cepheus the King, thence it runs through the star-pictures of Cassiopeia, and Perseus, and part of Auriga. It divides Gemini and Orion, and passes between the two Dogs, Canis Major and Canis Minor, thence twining down into the southern skies beyond our ken.

During the summer you start again at Cepheus, thence the stream of stars makes its way to Cygnus, where the path divides into two starry roads that run parallel, the lower one through Aquila the Eagle, Sagittarius, and Scorpius, the upper one through Ophiuchus and Scorpius.

Use your opera glass to trace the course of the Milky Way, and you will be delighted and amazed at the beautiful sights the glass reveals of the myriad lights that gleam along the way; particularly is this true of the region in Cygnus and Sagittarius. In the former, note the dark gap, or "Coal Sack," in the Milky Way within the triangle formed by the stars Alpha, Gamma, and Epsilon.

There are many of these vacant places in this thickly sown pathway of stars, and it is not known whether they are rifts in the Milky Way, or dark bodies interposed between us and the stars.

All through the ages the Milky Way has been observed by man, and it bears many fanciful titles, for it is easy to imagine that it is a starry path, a heavenly river, or a glistening snake.

Our Algonquin Indians imagined that the Milky Way was the path of departed souls, and the bright stars along the way marked the camp-fires built by the departed as they journeyed toward their eternal home. The poet Longfellow, in his beautiful poem, "Hiawatha," thus alludes to this attractive fancy regarding the Milky Way:

> Telling him a fire to kindle
> For all those who died thereafter,

Camp-fires for their night encampments
On their solitary journey
To the kingdom of Ponemah
To the land of the hereafter.

And again in the same poem we read:

Many things Nokomis taught him,
Showed the broad, white road to heaven,
Pathway of the ghosts, the shadows,
Rising straight across the heavens.

The Greeks called the Milky Way "the Road to the Palace of Heaven." They imagined that along this road stood the palaces of the illustrious gods, while the common people of the skies lived on either side of them. They also thought that this was the path taken by the chariot of the sun when it was driven by that rash youth Phaëthon, whose sad story you may read in connection with the star-picture of Eridanus, the River Po.

There is a pretty Swedish legend that tells of two lovers who longed to be near each other forever, but, sad to relate, after their death they found that they dwelt in separate stars far removed from each other. They longed so to be together that they set about building a bridge of light between their stars so that they might cross over and once more be close to each other, and the Milky Way was the starry bridge built by these devoted lovers that enabled them to fulfill their heart's desire.

The Japanese have a similar myth. They re-

garded the Milky Way as a silver stream twining across the sky, and you remember the story of the Magpie Bridge that is related in the description of the star-picture of Aquila, the Eagle, where once a year the lovers met by crossing the Milky Way.

The Chinese also imagined that the Milky Way was a river, and they observed that when the moon was seen in the sky, the river disappeared from view. This, they said, was because the silvery fishes that swim about in the river hid themselves when the moon appeared, as the new moon seemed to them to be a silver fish-hook which they were wary of.

Another curious fancy relating to the Milky Way was that of the ancient Peruvians. They imagined that it represented the dust of the stars, and we find the same idea current among the Pawnee Indians, who thought the Milky Way was the dust kicked up by a buffalo and a horse racing across the sky.

In ancient Judæa and Armenia the Milky Way was regarded as a Long Bandage wrapped around the heavens. According to a beautiful French legend the stars in the Milky Way are lights held by angel spirits to show mortals the way to heaven.

There are many strange stories to account for the Milky Way. According to mythology, the way was formed by the milk dropped from the breasts of Juno when she was suckling the infant Hercules.

The early Egyptians fancied that the dropping of innumerable wheat heads formed this famous pathway in the sky. The ancient Britons had the follow-

ing names for the Milky Way: "Watling Street," "Asgard's Bridge," and "the Fairies' Path."

It is fascinating to look upward on a summer's night at this wide stretching band of light that arches the sky like a great white bow, and think of the stories and legends that the people of all ages have woven about it. Now that we know the reason for the cloudlike appearance of the Way we are filled with wonder at the thought of the innumerable suns that compose it.

In one rich region of the Milky Way, Sir William Herschel counted within the space of one hour 116,000 stars that passed before him in review in the field of vision of his telescope. Truly the Milky Way is the most sublime and majestic sight that the night reveals to human eyes, and if the fancy is true that it is the road taken by departed souls what must the glory of heaven be to have such a jeweled and glorious pathway leading to it!

THE ZODIAC

SIGNS OF THE ZODIAC

. . . a broad belt of gold of wide extent,
Wherein twelve starry animals are shown,
Marking the boundaries of Phœbus' zone.
LUIZ DE CAMOËNS' *Os Lusiadas.*

BEFORE taking up the study of the Planets, which is necessary as these wandering bodies are often mistaken for stars, we must identify the path they travel in their ceaseless circling of the sun.

This planet track is a definite right of way bounded by imaginary lines drawn on the night sky, which it completely girdles, and the name of this path is the Zodiac.

The Zodiac is divided into twelve equal divisions, in each of which is a star-picture. Their names are given in order in the ancient rhyme which you will find in the appendix, and which you should memorize.

The names of these twelve star-pictures in the order in which they appear in the sky together with their symbols are as follows: The Ram ♈, the Bull ♉, the Twins ♊, the Crab ♋, the Lion ♌, the Virgin ♍, the Scales ♎, the Scorpion ♏, the Archer ♐, the He-Goat ♑, the Water-Bearer ♒, and the Fishes ♓.

You know these star-pictures if you have studied

the book carefully, and if you see a bright starlike-looking object in any one of them you may be quite sure that it is a planet. There are only three planets that will be apt to confuse you, and in the Chapter on the Planets you will be informed how to identify them.

The path of the Zodiac is only sixteen degrees wide. You recall that the "Pointer stars" in the Big Dipper are five degrees apart; the path of the Zodiac is therefore only a little over three times this distance in width.

The Planets all keep strictly within the boundaries of this pathway, and will not trouble you in the least as far as the star-pictures outside the Zodiac are concerned.

The almanacs keep us informed of the star-pictures of the Zodiac in which the planets are moving, and this information will always guide you in identifying them. A glance should really tell you whether the bright starlike body is a planet or not, for the stars twinkle because of their great distance from us, whereas the planets, which are comparatively near, glow with a steady light quite unlike starlight.

THE PLANETS

THE PLANETS

We will assume that you are acquainted with the star-pictures, and that the starry skies are no longer a puzzle to you, but a source of friendly interest and pleasure.

There are, however, bodies in space that are not stars but resemble them very much, and are often mistaken for them. These starlike objects are in constant motion, and you can easily see that it is necessary for you to know them for otherwise you will be confused by their appearance in the sky, and will not find them on the diagrams. You might think they were new stars.

These shining bodies are called "Planets," from a Greek word meaning a wanderer. The Earth is a planet, and there are seven others all belonging to the Sun's family, which is known as the Solar System. All of the planets circle about the Sun, just as the Moon turns constantly about the Earth, and the stars appear to circle about the North Star.

The Planets differ in this respect from the stars, they shine with reflected light from the Sun, just as the Moon does, whereas the stars are all great suns and the light they flash to us is that of the fire that glows within them.

You have often held a small mirror in such a position that you threw a beam of sunlight on different objects, lighting them up with the sun's light reflected from the mirror. You can regard the Planets as so many mirrors in the sky on which the Sun shines and reflects its light from them into our eyes.

If the Sun's light was extinguished we would not see the Planets at all, they would disappear from view the minute the Sun no longer shone, but we would still see the stars shining in the sky as if nothing had happened.

Because of the fact that the Planets are nearer to us than the stars they do not twinkle as the stars do, but burn with a steady light, and this fact helps us to identify them.

We should naturally be very much interested in the Planets for they are our neighbors and relatives, and in the Sun we have with them a common parent. Then there is always the fascinating thought that some of them may be inhabited by intelligent beings whom we may be able to communicate with some day.

How thrilling it would be to learn that a message that we could interpret had been received from one of the Planets! We would all be anxious to learn what was happening on another world, and we might learn of many interesting inventions that would be of lasting benefit to the race. Nothing is impossible, and some day communication may be established with one of the Planets.

You might think that it would be very confusing

to have these starlike bodies wandering about in the sky, and that it would be difficult to recognize them, but it is really very easy to make their acquaintance for they each have some distinguishing feature that enables us to recognize them.

Only six of the Planets are visible to the naked eye, and two of these are seldom seen, as one is close to the Sun, comparatively speaking, and can only be glimpsed at certain times, while the other is very faint and you could barely see it unless you knew exactly where to look for it. This leaves only four Planets to identify and they are easily recognized.

You are now ready to be introduced to the Sun's family, and we will present them to you in their order, counting outward from the Sun. The diagram shows you their circling paths about the Sun as they would appear if you looked down on them from a great height.

These are the names of the Planets:

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. The Earth, you will note, lies between Venus and Mars, so these Planets are our nearest relatives and especially interesting on that account. You will learn to love Venus, for she is the brightest of the Planets and the most beautiful object in the night sky, excepting the Moon.

Mars is an object of wonder and mystery, for it is suspected by many that it is inhabited, but we are by no means sure of the fact. Now that you know the names of our Planet relatives you will wish to know something about each of them and how to

recognize them. Space will not permit of our telling you very much about them, but we will take them up in the order named and state the important facts concerning each of the Planets.

MERCURY

MERCURY, the "Swift Messenger of the Gods," is the smallest of the Planets and the nearest to the Sun. It is 3000 miles in diameter, and 36 million miles from the sun around which it moves, making one complete revolution in eighty-eight days, the year of Mercury. It is thought to turn once on its axis in the same time, and has no moon circling about it to add to the beauty of its night skies.

Because of its rapid motion, and its nearness to the Sun Mercury is difficult to see and will not bother you in the least as far as the identification of the star-pictures is concerned. It is worth while, however, to hunt for the Planet for the satisfaction of seeing this relative of ours.

If you will attach a short piece of string to the stem of an apple and let the apple swing between you and a lighted lamp, just as a clock pendulum swings, you will note that when the apple is directly between you and the light that it is indistinct because of the glare of the light, but when it reaches the end of its swing on either side of the lamp you see it perfectly, though momentarily.

The motion of Mercury, as it appears to us, is very similar in appearance to that of the swinging

apple. Of course the Planet really revolves completely about the Sun, but seen on the background of the sky, Mercury appears to swing like a pendulum between us and the Sun.

When the Planet is directly between us and the Sun the glare of the Sun hides it from our view, but at certain times it reaches the farthest point on either side of the Sun, and then it is that we can see the Planet plainly for a few days at a time.

The almanacs generally state the times when Mercury reaches these favorable positions, which are called points of elongation east and west. These occur generally during the months of March, April, August, and September.

Under the best conditions we can see Mercury six times a year, three times in the evening shortly after sunset, low in the western sky, and three times in the early morning just before sunrise in the eastern sky.

Mercury is never more than twenty-eight degrees from the Sun, and this distance is about the distance between the first of the "Pointer Stars" in the Big Dipper and the North Star.

The most convenient time to look for Mercury is some evening in spring when your almanac tells you that Mercury is at the point of eastern elongation. Select a place that commands an uninterrupted view of the western horizon, and soon after sunset begin to search for the Planet to the left or south of the point of sunset, obliquely, that is in a slanting direction, up the sky from it, and at a distance from the place of sunset about equal to four times the dis-

tance separating the "Pointer Stars" in the Big Dipper. It is well to use an opera glass to aid your search, which, if you have patience, is sure to be rewarded with a shy glance from Mercury which may appear to twinkle because of the haze of the horizon.

Mercury appears brighter than Arcturus, the brilliant star in the star-picture of the Herdsman, and is somewhat red in color. In the telescope the planet is a charming sight as it takes the moon's phases. The view of the silvery crescent of Mercury is entrancing.

Few people, comparatively speaking, have ever seen Mercury. Copernicus, one of the founders of the science of Astronomy, wrote: "I fear that I shall descend to the tomb without having seen the planet," and his fears were realized for he died without beholding it.

If for no other reason than the rarity of the sight, the planet is worth searching for, and it is really great fun to hunt for it. I hope you will not rest content until you have seen this shy neighbor of ours.

Owing to the fact that Mercury is fairly close to the Sun there is little chance of its being inhabited, and it is not a planet that interests us on that account.

The Greeks called Mercury "Apollo," "the god of Day," and Mercury the god of Thieves, who take advantage of night to commit their evil deeds; for they saw in Mercury two different planets, one a morning, the other an evening planet, which was quite a natural mistake.

The Egyptians and Indians made the same error. The former called Mercury, "Set and Horus," the latter "Boudda and Rauhineya," divinities of Day and Night. Another Greek name for Mercury was "the Sparkling One," and when astrology was in vogue the planet had an evil reputation.

The almanacs represent the different planets by symbols, that for Mercury is ☿, the conventionalized form of the wand carried by the fleet-winged messenger of the gods, as a symbol of his power, just as the silver gray hound is the symbol of authority carried by the King of England's messengers.

"VENUS"

WHAT Mercury lacks in brillance the planet Venus, the next in order counting outward from the Sun makes up for. It is the brightest object in the night sky with the exception of the Moon, and consequently easy to identify. Its brilliance is largely due to the fact that it is the nearest planet to us. Venus is so bright that it casts a shadow and can easily be seen at noonday. It is six times as bright as Sirius, the brilliant Dog Star.

Venus is 67 million miles from the Sun it circles, and is almost the size of the earth, being 7629 miles in diameter. It is often called our "Sister Planet."

At its nearest approach to us Venus is 23 million miles away, nearer to us than any other heavenly body save the Moon and one asteroid. The Planet's year is 225 days, the time it takes to make one complete revolution about the Sun. Owing to its dense atmosphere of clouds which we cannot pierce, the length of its day has not been definitely determined. Venus like Mercury does not possess a Moon, although astronomers have often searched for one.

As Venus is between us and the Sun it appears to swing as a pendulum, just as Mercury appears to do, being seen alternately, first on one side and then on

the other side of the Sun, to the east and west of it, alternately an evening and morning star respectively.

When Venus is east of the Sun we see it as a glorious star in the west, in the twilight, growing brighter and more beautiful each moment in the waning light of day. We can never mistake it because of its surpassing brilliance. An almanac will inform you when it is an evening star, and then you will always see it in the west and south of the point of the sunset, and never over three hours from the Sun; that is, it is never visible in the evening more than three hours after sunset, or more than forty-eight degrees from the Sun.

Venus is so easily recognized because of its superior brilliance, and its position as regards the Sun, that it cannot possibly confuse you in studying the star-pictures, and you will identify it at once as a planet and not a star.

The sight of Venus in a telescope is very beautiful, for when it is brightest we see it as a beautiful silvery crescent like the young Moon in miniature. The phases of Venus were seen for the first time by Galileo in September, 1610, who beheld the spectacle with a joy impossible to describe. According to the customs of the time he announced his discovery in an anagram in Latin, hiding the truth very cleverly so as not to be robbed of the discovery. When translated it read: "The mother of Loves puts on the phases of the Moon."

The earliest recorded observation of Venus dates from 686 B.C. and appears on an earthenware tablet

now on exhibition in the British Museum. Because of its beauty and brilliance Venus was doubtless the first of all the planets to attract the admiring gaze of primitive man. Seen in the twilight and the dawn the planet would appear to rule these seasons and it is not to be wondered at that the planet held a high place in the reverence and worship accorded the heavenly bodies.

It may be of interest to note a few facts relating to the ancient history and worship of Venus.

The Greeks, seeing the planet in the western sky in the twilight, and the eastern sky at dawn, thought there were two planets and named the evening star "Hesperus" and "Vesper," and the morning star "Phosphor" or "Lucifer," the Light Bearer. They also knew the planet as "Callisto," the most beautiful, a very appropriate title.

In the *Iliad* the only planet mentioned is Venus, which is called "Hesperus," the fairest star in the heavens.

> As radiant Hesper shines with keener light,
> Far beaming o'er the silver host of light.

In very ancient times Venus was considered under the rule of the Assyrian goddess Ishtar, and on a Babylonian inscription she is addressed as Ishtar, eldest of Heaven and Earth, raising the race of warriors.

In many ancient cities, notably Nineveh, temples were erected to the worship of Ishtar, over a thou-

sand years before the birth of Christ. The Hindus called Venus "Sukra," the brilliant, and the ancient Mexicans had temples to Venus, their name for the planet being "Citlal Choloha."

Among the natives of South America, Venus was known as "the star who announces the day." The ancient Arabians worshipped Venus under the name of "Zoharah."

The first to discover the identity of the planet was Pythagoras, about 540 B.C., or, according to some authorities, Parmenides, about 513 B.C. and doubtless Venus was the first planet to be distinguished as a body distinct from the stars.

Although in this later and more material age, when Venus no longer figures in idolatry and has lost the divine personality that pagan worship endowed her with, she still possesses a subtle charm for us, and the sight of her sparkling beams in the twilight sky delights and captivates all lovers of the beautiful.

The almanac symbol for Venus is ♀ representing a looking-glass which the goddess of beauty is supposed to hold in her hand, doubly appropriate, for the planet itself is but a looking-glass reflecting the dazzling rays of the orb of Day.

EARTH

ALTHOUGH this book is designed as a guide to the star-pictures, it is necessary for us to know the bright planets which wander through the sky in the path of the Zodiac, so as to distinguish them from the stars. Just a word in passing regarding our Earth, which is one of the planets circling about the Sun between the orbits or paths of the planets Venus and Mars.

The diagram will show you how the planets and their paths would appear if you were up very high in the sky, and could look down on the Sun and his family of eight planets.

Many people who know when America was discovered and many facts of history do not know the size of the Earth, its distance from the Sun, and how to account for the change of seasons, which are very important facts for every intelligent person to know.

The Earth is 7918 miles in diameter, and slightly larger than the planet Venus. It is 93 million miles from the Sun, around which it revolves once in a little over 365 days, at the rate of eighteen and one half miles a second, which is our year. The Earth turns about its axis in a little less than 24 hours, which gives us our day, and the fact that the Earth's

axis is inclined to the plane of its path about the Sun accounts for the seasons.

There is another point in connection with the Earth that few people think of, and that is that the Earth reflects the light of the Sun just as the Moon and all the planets do, and from the neighboring planets the Earth would appear as a shining star.

Seen from Venus the Earth would appear as a star brighter than any we see. Seen from Mars it would still appear as a bright star, but seen from Jupiter the Earth would look like a very faint and insignificant star, and if there are inhabitants on Uranus and Neptune they would not see us at all.

THE MOON

JUST a word about the Moon which is a prominent and beautiful feature of our night skies. The Moon is 2162 miles in diameter, and it is the nearest heavenly body to us, circling about the Earth at a distance of 239,000 miles. It revolves around the Earth once in a little over twenty-seven days, moving eastward in the sky about thirteen degrees every day, and always keeps one side toward us.

We know a great deal about the Moon and are quite sure that it is nearly, if not absolutely, a dead world. It is devoid of water and of course uninhabited. The lunar surface presents many interesting features, there are many lofty mountain ranges and many of the peaks surpass in height the mountains of the Earth. It also contains a great many ringed-plains, or craters, of a type quite different from the Earth's craters. This gives the Moon a strange mottled and pitted appearance. We do not know what caused these peculiar formations. They resemble great amphitheatres, such as the Coliseum at Rome and the Yale Bowl, on a huge scale, only instead of tiers of encircling seats you must imagine an absolutely circular range of high mountains encircling a level plain. There are thousands of these

craters on the Moon and they vary in size from three to 150 miles in diameter. Even a small telescope reveals the craters and many other interesting features of the lunar surface.

The dark spots on the Moon that form the imaginative and well known features of the Man-in-the-Moon, are called seas, but they contain no water and may be the dried-up beds of ancient oceans.

An opera glass will reveal much that is interesting on the Moon, and in a large telescope the sight of the Moon is wonderful beyond expression.

Few people can explain the causes of the Moon's phases, the gradual change in the appearance of the Moon from the crescent to the full Moon, and the reverse.

The best way to understand this phenomenon is to illustrate it for yourself. In Professor Todd's *New Astronomy* the following excellent illustration is given substantially as follows:

Accurately remove the peel from half an orange. Let a lamp in one corner of a room otherwise dark represent the Sun. Stand at a convenient distance from the lamp. Your head represents the Earth. Pierce the orange with a darning needle to hold it by, and held at arms length the orange represents the Moon. Turn the white half of the orange toward the lamp. The orange is now in the position of the new Moon, its dark side is toward us and the Moon being directly between us and the Sun is invisible. Turn slowly to the left, and at the same time turn the orange in such a way that the peeled side of the

orange always faces the lamp squarely. Watch the white half of the orange as you turn, and its changing shape represents all the Moon's successive phases or changes in appearance. New Moon, when the orange is between the eye and the lamp. First quarter (half Moon), when the orange is at the left of the lamp and you have turned one quarter of the way around. Full Moon, when the orange is directly opposite the lamp and you have turned half way around, and so on till you resume the first position. This clearly illustrates the Moon's phases and the diagram will also serve as an additional explanation.

Astronomers have proved that the Moon does not appreciably effect our weather, although it is very difficult to convince people of this fact. The Moon is, however, largely responsible for the creation of the tides in the waters of the Earth, the Sun being the only other body that exerts such an influence.

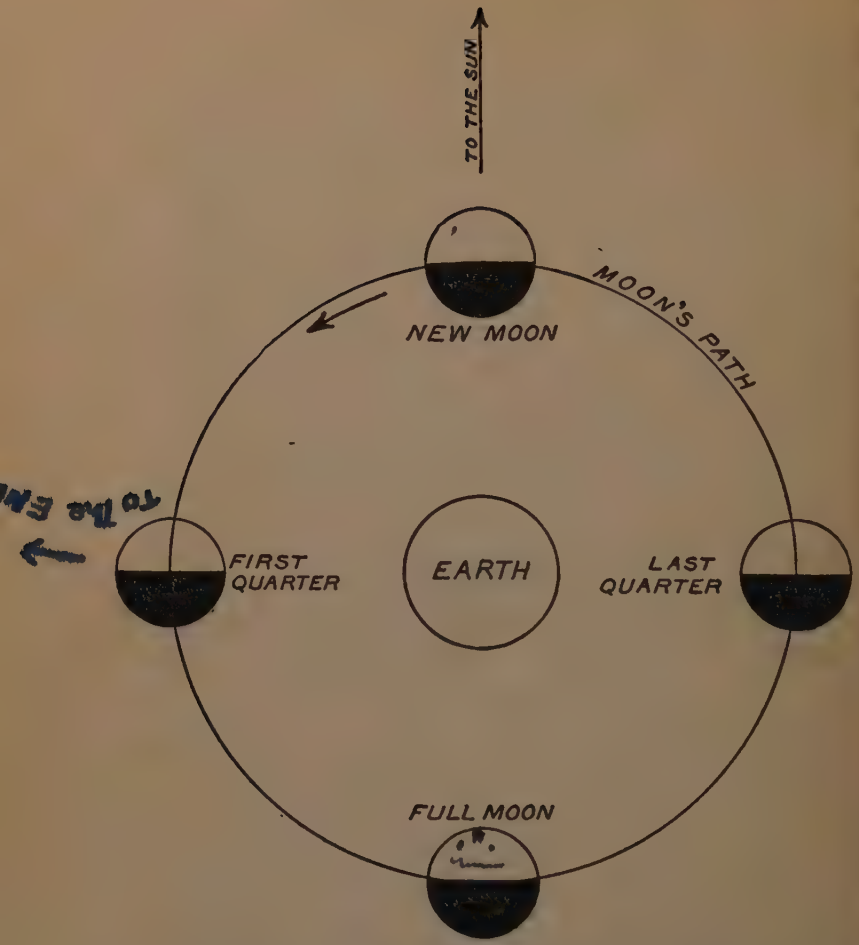


Diagram showing the position of the Earth, Moon, and Sun, at the time of New Moon. The Moon is invisible as its dark side is towards the earth. Turn the book from right to left to obtain the correct view of the successive monthly changes in the appearance of the Moon as seen from the Earth.

MARS

We come now to the most interesting of all the planets, the ruddy Mars, one of the three planets that may confuse you in your study of the star-pictures of the Zodiac.

It is really easy to identify the planet Mars even if we did not have an almanac to guide us, for its ruddy hue renders it unmistakable. However, you recall in your study of the star-pictures that the bright stars Antares in the Scorpion, and Aldebaran in the Bull, are both decidedly red in color, and as Mars, in its journey around the Sun along the path of the Zodiac, sometimes passes close to these stars, it tends to confuse us a bit as to its identity. A glance, however, should enable you to distinguish which is the star and which the planet, for the latter glows with a steady light while the former twinkles. The diagram of the star-picture will show you the exact position of Antares and Aldebaran, and if you see a starlike body of a red color not on the diagram you may be sure that it is the planet Mars.

Mars is only 4230 miles in diameter, and consequently only a little more than half as large as the Earth. Its average distance from the Sun is 141,500,000 miles, and it revolves once about the Sun in

687 days, which is the year of Mars. The planet rotates on its axis once in a little over twenty-four hours, so the day of Mars is about the length of our own day.

Although smaller than the Earth, Mars has two Moons; they can only be seen in a large telescope and were discovered by Dr. Asaph Hall, an American astronomer. Their names are Deimos and Phobos, and they are very small, not being over thirty miles in diameter, whereas our Moon is 2000 miles in diameter. Mars has polar caps that resemble the polar caps of snow in the Arctic and Antarctic circles of the Earth.

Some authorities claim that Mars is inhabited, and many faint lines and markings have been observed on the planet which have been called "Canals" that appear to be artificial, but the whole matter of the habitability of Mars is still unsolved. Whenever we look at the red planet we must regard it as the possible abode of life, and the thought is certainly a fascinating one.

There are recorded observations of Mars made as early as 272 B.C.

The symbol of the planet is ♂ representing a shield and spear, the warlike implements of the god of War.

THE ASTEROIDS

BETWEEN the planets Mars and Jupiter there is quite a gap in space where there are no planets. In place of a planet we find a great many little planets, none of which are probably larger than five hundred miles in diameter, which are called Asteroids or Planetoids, and about one thousand of them have been discovered.

Only one of the Asteroids can be seen with the naked eye; it is called Vesta, and resembles a very faint star; consequently it will never confuse you in your study of the star-pictures.

One of the Asteroids, named Eros, sometimes comes comparatively close to the Earth at a distance of 13,500,000 miles, approaching nearer to us than any other body in the sky excepting the Moon.

It is thought that ages ago there may have been a planet between Mars and Jupiter, which for some reason was broken to bits. Its fragments now revolve about the Sun, a swarm of little planets.

JUPITER

Beyond the Asteroids swings in space the "Giant Planet," the colossal Jupiter, at a distance of 448 million miles from the Sun. It would take a cannon ball fifty years to travel this great distance.

Jupiter is 86,500 miles in diameter, over ten times the Earth's diameter, and is greater than all the planets combined. The planet revolves around the Sun once in eleven years, ten months, and seventeen days, and rotates on its axis once in about ten hours, the short day of Jupiter. This rapid motion makes the planet an interesting one to observe in a telescope, but unfortunately there is little to be seen except the belts that encircle it. These may be clouds, but some astronomers think that Jupiter is still in a plastic, or liquid, state, and that we actually see its surface. It requires a telescope to see the belts of Jupiter, and they have been studied attentively for many years.

We can hardly mistake Jupiter, for although it is not as bright as Venus, still it is brighter than our brightest star, Sirius. Its light is yellowish, while that of Venus is white.

Jupiter has nine Moons, four of which can be easily seen in a small telescope and present a beauti-

ful sight as they circle the planet. Life on Jupiter is out of the question as it is assumed to be still very hot. The most ancient observation of Jupiter on record is the note of an eclipse of the star Delta Cancri by the planet, September, 3,240 B.C.

Jupiter weighs more than three hundred times as much as the Earth, and the Sun itself weighs only six times more than this big brother of ours.

The four bright moons of Jupiter bear the attractive names: Io, Europa, Ganymede, and Callisto; they were discovered by Galileo in 1610, and were the first heavenly bodies discovered by means of a telescope.

At the time of this discovery, people thought that the Earth was the centre of everything, and that the Sun travelled around it. Galileo thought otherwise; he was sure that the Sun was the centre of the solar system, and that the Earth and planets all circled about it, which is true, but he could not convince people of the fact any more than Columbus could convince his countrymen that the Earth was round.

When Galileo saw the moons of Jupiter circling about that planet he called his friends to see the great sight, but they would not believe the evidence of their own eyes, and thought that Galileo was a magician and threw him into prison. Later he was allowed his freedom and began observing with his telescope, and finally was able to convince people that Jupiter's moons really circled about the planet; but they still thought that Galileo had bewitched the telescope or their eyes, and they sought every way to

discredit his theory which was so beautifully illustrated for them in this sight of Jupiter's moons.

It is very interesting to view these tiny moons of Jupiter when we recall the struggles of Galileo to convince people of one of the greatest facts of the Universe.

Jupiter travels slowly and majestically, as becomes the King of the Planets, through about one sign of the Zodiac each year, and on this account is not difficult to locate in the sky if we have once observed the planet.

The symbol of Jupiter, ♃, is a curious one, and represents the Eagle, the bird of Jove.

SATURN

SATURN is probably the most beautiful sight in the heavens viewed in a telescope, and it is farther removed from the Earth than any of the planets in the Sun's family visible to the naked eye.

The planet ranks next to Jupiter in size, being 73,000 miles in diameter. It is distant 886 million miles from the Sun, around which it makes one complete revolution once in twenty-nine and one half years, so if you lived on Saturn you would not have many birthdays. It revolves on its axis in a little over ten hours, and has a short day of about the same length as Jupiter's.

Saturn is about the only planet that is apt to cause confusion in locating the star-pictures of the Zodiac as it closely resembles a bright star. The planet is always as bright as Altair but never as brilliant as Sirius, Mars, or Jupiter. It glows with a dull steady yellowish light sometimes tinged with green, and never twinkles. If you are in any doubt concerning its identity consult an almanac, and this will inform you in which sign of the Zodiac the planet is located.

Saturn takes two and one-half years to pass through one of the Zodiacal star-pictures, so you see it apparently moves very slowly in the heavens.

The planet is rich in moons, having no less than ten, but they are all telescopic objects. Saturn differs from all the planets of the Sun's family in this respect, it is circled by a ring. In the telescope, the planet resembles a marble striped with bands, enclosed in a golden ring, truly a remarkable and beautiful sight. The ring is really composed of several concentric rings, and is made up of many small bodies in rapid motion, giving the appearance of a solid ring.

The discovery of the rings of Saturn is an interesting story, but we have not space for it here, as we are chiefly concerned with the means of distinguishing the planets from the stars to avoid confusion in the study of the star-pictures.

If you are able, you must secure a telescope and view for yourself the wonderful sights in the heavens, and particularly the marvelous rings of Saturn. If you know of anyone who has a glass ask to be allowed to observe with it, and I am sure your request will be granted. The sights the telescope reveals will fill you with wonder and amazement.

As Saturn was the ancient god of Agriculture, the symbol of the planet is ♄, the figure of a scythe.

URANUS

It is merely necessary to mention Uranus, the next planet in order outward from the Sun, which was for a long time thought to be the outermost planet, as it is barely visible to the naked eye, and consequently will never confuse you when you are studying the star-pictures.

Uranus is 1,800,000,000 miles from the Sun around which it revolves once in 84 years, so few of the Uranians, if the planet is inhabited, have more than one birthday.

Uranus has four tiny moons, but it is so far distant that we have not been able to discover the length of the planet's day, that is, the time it takes to make one complete revolution on its axis.

The almanac symbol of the planet is this figure, ♅.

NEPTUNE

THE planet Neptune is never seen with the naked eye. It is at present the outermost planet known and is distant from the Sun 2,800,000,000 miles. The planet makes one complete revolution about the Sun in 164 years. Its length of day is not known, and it has but one moon.

The story of the discovery of Neptune is so remarkable that it is always worth while repeating, and should be familiar to everyone. It ranks as one of the greatest intellectual achievements of man.

The discovery of the planet was due to the efforts of two great mathematicians, John C. Adams, a young Englishman, and Urbain Leverrier, a Frenchman, who independently and simultaneously began the great task of plotting its suspected position in the sky. All that they had to guide them was the fact that the planet Uranus, then the outermost planet, did not move in accordance with theoretical predictions, which led astronomers to think that there was a distant planet that affected its movements.

After two years of work on the problem, Adams solved it and sent the results of his calculations to the Astronomer Royal of England, but for some reason or other no search was made for the new

planet. Soon after, Leverrier completed his work and sent the result to Galle, the Director of the Observatory at Berlin, and a search was immediately made. Within half an hour the new planet was discovered close to its calculated position. This was on the night of September 23d, 1846, a date you should always remember. Adams, of course, claimed a share in the discovery, as he had been deprived of the glory through no fault of his own, and his name is now linked with Leverrier's in the World's Hall of Fame.

In conclusion, let us briefly review the points that will enable you to identify the planets, and prevent your mistaking them for the stars in your study of the star-pictures of the Zodiac.

We have only Venus, Mars, Jupiter, and Saturn to consider.

Venus because of its great brilliance, and its comparatively close distance from the Sun, is unmistakable. Its light is white, and it is generally seen in the western sky soon after sunset.

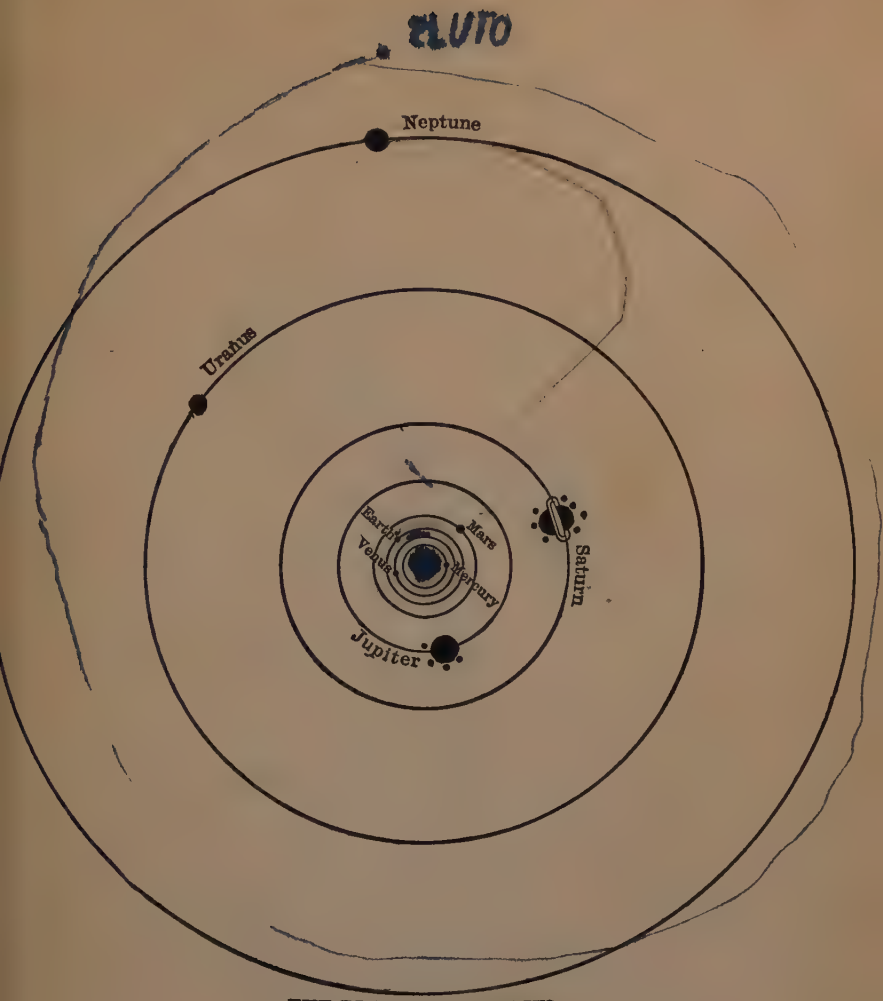
Mars is red in color, and glows with a steady light. It could only be confused with the red stars Antares in the Scorpion, and Aldebaran in the Bull, and a study of the diagram of the star-pictures will reveal the presence of Mars if it is in one of these pictures.

Jupiter is yellow in color, and brighter than the brightest star Sirius, but not as bright as Venus.

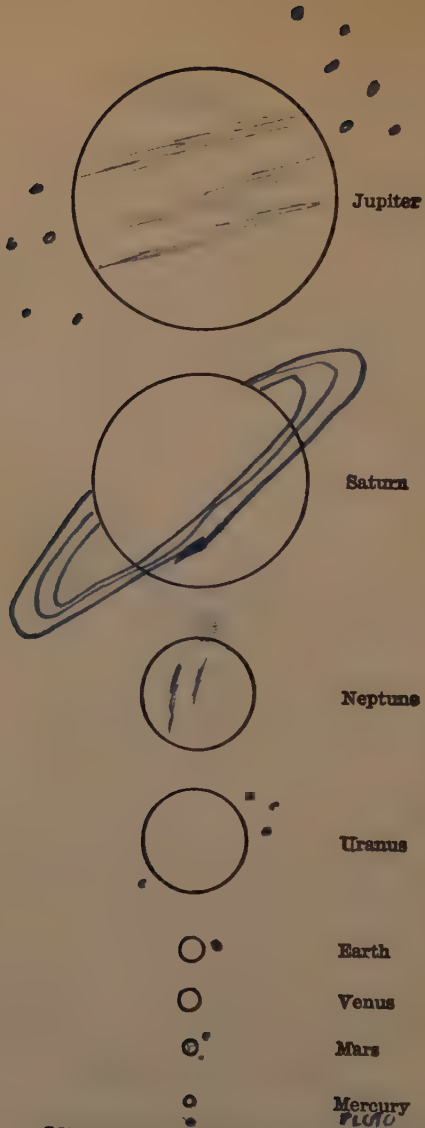
Saturn glows with a steady dull yellowish light, about as bright as Altair. It cannot be mistaken for Antares and Aldebaran which are red stars. There

are only four other bright stars in the star-pictures of the Zodiac: Castor and Pollux in the Twins, Spica in the Virgin, and Regulus in Leo; these stars are all white in color and twinkle.

Study the diagrams of the star-pictures carefully and in case of doubt consult an almanac as to the location of the planets.



THE PLANETARY ORBITS



COMPARATIVE SIZE OF THE PLANETS.

APPENDIX

SIDES

THE RHYME OF THE STAR-PICTURES OF THE ZODIAC

The Ram, the Bull, the heavenly Twins,
And next the Crab, the Lion shines,
The Virgin, and the Scales.
The Scorpion, Archer, and the Goat,
The Man who pours the Water out,
And Fish with glittering tails.

THE MOST FAVORABLE TIME TO OBSERVE THE CIRCUMPOLAR STAR-PICTURES IN THE NORTHERN SKY IN THE EARLY EVENING

Ursa Minor. Well placed throughout the year.
Ursa Major. March 1st to August 1st.
Cassiopeia. February 1st to October 1st.
Cepheus. January 1st to August 1st.
Draco. November 1st to June 1st.

PERPETUAL STAR TIME-PIECE, COMPASS, AND CALENDAR

If you know the star-pictures, and memorize the following rhyme, you will ever have at hand for reference on clear nights, a reliable time-piece, compass, and calendar.

The numbers above the star names indicate consecutively the months of the year in which these respective objects rise about the first of each month in the eastern

sky. In addition to first magnitude stars the rhyme refers to the head of Capricornus, the Sea-Goat, the Great Square of Pegasus, and Orion's Belt. All except Arcturus rise between 9 and 9:30 P.M. Arcturus rises at 10 P.M. February 1st.

1
First Regulus gleams on the view,
2 3 4
Arcturus, Spica, Vega, blue,
5 6
Antares, and Altair,
7 8 9
The Goat's head, Square, and Fomalhaut,
10 11
Aldebaran, the Belt, a-glow,
12
Then Sirius most fair.

Eight months of the year are identified by the position of the Big Dipper at 9 P.M. In April and May it is north of the zenith. During July and August it is west of north. In October and November it lies close to the northern horizon and in January and February it is east of north with the "Pointer Stars" highest.

NOTE

Many readers of this book may be fortunate possessors of small telescopes. It may be that they have observed the heavens from time to time in a desultory way and have no notion that valuable and practical scientific research work can be accomplished with a small glass. If those who are willing to aid in the great work of astrophysical research will communicate with the author,

whose address is Norwich, Conn., he will be pleased to outline for them a most practical and fascinating line of observational work that will enable them to share in the advance of our knowledge of the stars. It is work that involves no mathematics, and its details are easily mastered.

TABLE SHOWING THE STARS OF THE FIRST AND SECOND MAGNITUDE RISING IN THE EASTERN SKY AT NINE O'CLOCK P.M. ON THE DATES SPECIFIED.

DATE	NAME OF STAR	STAR-PICTURES
January 1	Regulus, 1st.	Leo.
" 8	Alphard, 2d.	Hydra.
" 11	Cor Caroli.	Canes Venatici.
February 20	Arcturus, 1st.	Boötes.
March 1	Spica, 1st.	Virgo.
" 5	Gemma, 2d.	Corona Borealis.
April 1	Vega, 1st.	Lyra.
" 20	Ras Alhague, 2d.	Ophiuchus.
" 22	Deneb, 2d.	Cygnus.
May 9	Antares, 1st.	Scorpius
" 26	Altair, 1st.	Aquila.
June 5		Delphinus.
July 17	Algenib, 2d.	Perseus.
August 6	Algol	Perseus.
" 21	Capella, 1st.	Auriga.
" "	Hamel, 2d.	Aries.
" 27	Fomalhaut, 1st.	Piscis Australis.
September 13		The Pleiades in Taurus.
October 2	Aldebaran, 1st.	Taurus.
" 26	Bellatrix, 2d.	Orion.
" 30	Castor, 1st.	Gemini.
" "	Betelgeuse, 1st.	Orion.
November 4	Pollux, 2d.	Gemini.
" "	Rigel, 1st.	Orion.
" 27	Procyon, 1st.	Canis Minor.
December 4	Sirius, 1st.	Canis Major.
" 8	Phaet, 2d.	Columba.
" 14		The Bee Hive in Cancer.
" 16		The head of Hydra.

THE BRIGHTEST STARS VISIBLE IN LATITUDE 40°N.[1]

STAR	MAGNITUDE
The Sun	—25.4
Sirius	—1.58
Vega	0.14
Capella	0.21
Arcturus	0.24
Rigel	0.34
Procyon	0.48
Altair	0.89
Aldebaran	1.06
Pollux	1.21
Spica	1.21
Antares	1.22
Fomalhaut	1.29
Deneb	1.33
Regulus	1.34
Castor	1.58
ϵ Canis Majoris	1.63
ϵ Ursæ Majoris	1.68
Bellatrix	1.70
λ Scorpii	1.71
ϵ Orionis	1.75
β Tauri	1.78
α Persei	1.90
ζ Orionis	1.91
η Ursæ Majoris	1.91
γ Geminorum	1.93

[1] With the exception of the estimate of the sun's magnitude the list is taken from the Harvard Observatory Catalogue.

Other results for the stellar magnitude of the sun are as follows:

Wollaston: —26.6

Bond: —25.8

Zöllner: —26.6

The sun gives us: 10,000,000,000 times the light of Sirius.

LIGHT-GIVING POWER OF THE STARS, SUNLIGHT BEING EQUAL TO UNITY[1]

SIRIAN STARS		SOLAR STARS	
Procyon	25	Aldebaran	70
Altair	25	Pollux	170
Sirius	40	Polaris	190
Regulus	110	Capella	220
Vega	2050	Arcturus	6200

The total light of the stars is estimated as equal to $\frac{1}{80}$ of that of the full moon.

NEAREST LUCID STARS IN THE NORTHERN HEMISPHERE

Star Name	Magnitude	Distance in Light-Years according to Todd	Russell	Gore	Yale Univ.	Young	Newcomb
Sirius	−1.6	8.5	8.6	9		8.6	8
τ Ceti	3.6		9.7			10.2	10
Procyon	0.5	12	10	10	9.8	10.9	10
61 Cygni	5.6	7.2			11.1	8	7.3
Altair	0.8	16		14	14.1	13.6	14
Vega	0.1	27		40		21.7	29
Aldebaran	1.0	32		32	28	29.6	29
Capella	0.2	32		40	34		36
Polaris	2.1	47		46		44	54
Arcturus	0.2	160		160			108
β Cassiopeiæ	2.4			32			21

Of the fainter stars in the northern hemisphere the 7.4 magnitude star Lalande 21185 is probably the nearest star to the earth. The average distance as estimated by different authorities is 7.5 light-years.

The distance of the first magnitude star α Centauri in the southern hemisphere, probably the nearest star to the earth, is given by all authorities as 4.3 light-years. This distance is better realized if we

[1] From calculations made by Maunder.

adopt Prof. Young's comparison: If the distance from the earth to the sun were 215 ft. the distance from the earth to α Centauri would be 8000 miles.

On the scale measured at Yale University the mean distance of stars of the first magnitude is 36.5 light-years, second magnitude stars 58 light-years, and those of the third magnitude 92 light-years.

STARS APPROACHING THE EARTH

Star Names	Speed in Miles per Second			
	Potsdam	Todd	Greenwich	Vogel
Altair		23.9	27	23.7
Polaris	16.3		16	
Algol	2.3		2	
Arcturus			45	4.6
Vega	0.0		34	9.7
Deneb			36	5.1
Pollux			33	
Sirius				9.7
Procyon	7			5.5
Castor				18.4

STARS RECEDING FROM THE EARTH

Star Name	Speed in Miles per Second			
	Potsdam	Todd	Vogel	Greenwich
Aldebaran	30	31.1	30.1	31
Rigel	39	13.6	10.1	18
Betelgeuse		17.6		28
α Coronæ		20.3		
Capella	17		15.2	23
ε Orionis	34		35	15

Union Free School,

STELLAR AGE DEPICTED BY THE COLOR OF THE STARS

The figures within the circles indicate the relative size of the different types of stars, showing the great difference between the giant and dwarf stars.

NUMBER OF THE STARS[1]

First Magnitude	20	
Second "	65	
Third "	200	
Fourth "	500	
Fifth "	1,400	
Sixth "	5,000	
Seventh "	20,000	
Eighth "	68,000	
Ninth "	240,000	
Tenth "	720,000	1,055,185

The lucid, or naked-eye, stars comprise the first six magnitudes.

A 5″ telescope reveals stars down to the 13th magnitude, and Prof. Ritchey of the Mt. Wilson Observatory using the new 60″ reflector has photographed by four-hour exposures stars probably as faint as the 20th or 21st magnitude. It has been estimated that the total number of stars within our ken photographically speaking is possibly 125 million.

THE GREEK ALPHABET

As professional astronomers use the Greek letter star names, and as they appear on all star catalogues and atlases, a knowledge of the Greek alphabet is important, and it is given here:

α	Alpha	ν	Nu
β	Beta	ξ	Xi
γ	Gamma	ο	Omicron
δ	Delta	π	Pi
ε	Epsilon	ρ	Rho
ζ	Zeta	σ	Sigma
η	Eta	τ	Tau
θ	Theta	υ	Upsilon
ι	Iota	φ	Phi
κ	Kappa	χ	Chi
λ	Lamda	ψ	Psi
μ	Mu	ω	Omega

[1] From Todd's Astronomy.

INDEX OF CONSTELLATIONS

Name	Page
Andromeda	70
Antinoüs	302
Aquarius	126
Aquila	302
Aries	80
Auriga	54
Boötes	214
Bull of Poniatowskia	320
Camelopardalis	18
Cancer	266
Canes Venatici	222
Canis Major	182
Canis Minor	188
Capricornus	136
Cassiopeia	28
Cepheus	36
Cerberus	236
Cetus	194
Coma Berenices	226
Corona Australis	332
Corona Borealis	230
Corvus	256
Crater	262
Cygnus	296
Delphinus	310
Draco	44
Eridanus	200
Gemini	170
Gloria Frederica	70
Hercules	236

Named	Page
Hyades	102
Hydra	272
Leo	248
Lepus	164
Libra	338
Lyra	286
Milky Way	342
Monoceros	178
Ophiuchus	320
Orion	152
Pegasus	120
Perseus	62
Pisces	88
Piscis Australis	132
Planets	354
Pleiades	108
Sagitta	316
Sagittarius	332
Scorpius	326
Serpens	320
Sobieski's Shield	302
Taurus	94
Triangulum	80
Ursa Major	4
Ursa Minor	18
Virgo	242
Zodiac	350

INDEX

A

Aberration of light, 49
Achernar, 201
Achilles, 300, 335; cup of, 264
Acrisuis, 67
Actæon, 190, 191
Acubens, 268, 274
Adams, John C., 382
Æneas, 335
Æsculapius, 317, 322, 335
Æstræa, 339
Ætea, 85
Africans, 158
Age of stars, 98
Ages, Brazen and Iron, 245
Akkadians, 97
Albireo, double star, 299; color of, 299
Al-Chiba, 257
Alcor, 14
Alcyone, 115, 118
Aldebaran, 59, 95, 96, 97, 103, 104, 157, 251, 373
Alderamin, 38
Alfirk, 38
Algeiba, 252
Algenib, 63, 71, 109
Algol, 64, 65, 109
Algonquin Indians, 344
Algorab, 257
Alkes, 263
All-Hallow's Eve, 111
All Saints' Day, 111
Almach, 71, 73, 81
Almanacs, 352, 360
Almathea, 60
Alnilam, 157
Alnitak, 157, 158
Alpha and Beta in Big Dipper, 282
Alpha Cancri, 268
Alpha Herculis, 238
Alpha Libræ, double star, 339
Alpha in the Serpent, 322
Alphabet, Greek, 218, 282
Alphard, 273
Alphecca, 232
Alpheratz, 71, 72, 95
Al Rischa, 90
Altair, 303, 305, 307, 317, 334; color and distance of, 304
Amazon River, 104; star, 157
Ambrosia, 104
Amphitrite, 311
Anderson, Dr., 66
Anderson, Dr. J. A., 156
Andromeda, 32, 33, 34, 40, 71, 75, 76, 77, 81, 95, 137, 198; diagram of, 70; Nebula in, 74, 75
Andromeda's head, 72
Antares, 97, 251, 333, 373; brightness, distance, size of, 328; Arab name for, 328
Antinoöpolis, 306
Antinoüs, 303, 305
Apollo, 160, 258, 259, 299, 317, 322, 335; cup of, 264; Greek name for Mercury, 361
Aquarius, 127, 128, 129, 133, 137, 138; diagram of, 126
Aquila, 300, 303, 311; diagram of, 302; Arrowhead in, 303; Eta in, 304; Greek name for, 306; Nova in, 307; Turkish name for, 307
Arab name for Antares, 328; name for Cygnus, 300
Arabian worship of Venus, 366
Arabs, 34, 41, 48, 57, 97, 103, 269

Aratos, 33, 34, 58, 103, 115, 116, 184, 189, 201, 243, 249, 257, 263, 273, 311, 329
Arcadia, King of, 10
Arcas, 11, 23
Archer, the, 333
Arc light of the sky, 287
Arcturus, 215, 216, 217, 218, 223, 227, 231, 234, 244, 250, 288, 304; brightness of, 217; size of, 218; speed of, 217
Ares, sacred grove of, 85
Argonauts, 41, 85, 172
Ariadne, 233
Ariadne's Crown, 233
Arided, 299
Aries, 81, 89, 90, 95, 109; diagram of, 80; first star in, 82
Arietis, 82
Arion, 311, 312
Armenia, notion of Milky Way in, 346
Arrow, Cupid's, 317
Arrow, the three-jointed, 158
Arrowhead in Aquila, 303
Asellus Australis, 268; Borealis, 268
Asgard's Bridge, 347
Asia, 85
Assyrian goddess, 365
Asterion, 223
Asteroids, 375
Astræa, 245
Atauria, 111
Athamas, 85
Athens, King of, 59, 233
Athyr, 111
Atlas, 104, 114, 219
Auriga, 55, 59, 140, 210; diagram of, 54
Aurora, 186
Australia, 117, 176
Australis, Corona, 334
Axis, Earth's shifting, 289; of heavens, 50
Aztecs, 111

B

Babylon, 99
Babylonian inscription, 365
Babylonians, the, 90
Bacchus, 104, 140, 233, 270; cup of, 264
Basque legend, 13
Bear Driver, the, 215, 218
Bear, Little, 19, 21, 47, 148; diagram of daily path of, 22; Indian story of, 23
Bearer, Serpent, 321
Bee Hive, the, 268; number of stars in, 268
Bellatrix, 157, 158
Bellerophon, 123
Belt stars in Orion, 153, 157
Benetnasch, 15, 227
Berenice, 228
Berenice's Hair, 227
Bessel, 185
Beta Cygni, 299, 317; Leonis, 251; Lyræ, 290; Ursæ Majoris, 223
Betelgeuse, 97, 156, 157, 158, 171, 179; diameter of, 156
Bible, 110, 158
Biela's Comet, 73
Bielid Meteors, 73
Big Dipper, 209, 282, 352; Alpha and Beta in, 282
Bird, the, 300
Bird, of the Desert, 258; Great Seed, 258; of Zeus, 306
Bithynia, Antinous native of, 305
Blaze star, 232
Bœotia, 49, 50
Bohemian name for Lyra, 292
Bootes, 215, 218, 219, 231, 234, 250, 321; diagram of, 214
Borneo, 117
Boudda, 362
Bow, in Sagittarius, 333
Bradley, Dr., 50
Brahé, Tycho, 30
Brazen serpent, 322
Bridge, Asgard's, 347; Magpie, 306, 346
Bringer of Good Tidings, 138
Britons' notion of Milky Way, 346; name for Lyra, 292
Browning, Mrs., 267
Bryant, William Cullen, 25, 121, 237

Bull, the, 59, 95, 96, 99, 100, 158, 201, 335; eye of, 97
Bull Killer, 335; Polish, 322
Bull of Poniatowskia, 322
Burritt, 258

C

Cadmus, 50
Callimachus, 58
Callisto, 10, 11, 23, 365, 377
Camel, the great, 97
Camöens, Luiz de, 351
Cancer, 267, 268, 269, 274; diagram of, 266
Cancri, Alpha, 268; Iota, 269; Zeta, 269
Canes Venatici, 223; diagram of, 222
Canis Major, 183, 186; diagram of, 182
Canis Minor, 189; diagram of, 188
Canopus, 117
Capella, 55, 56, 57, 58, 95, 133, 176, 210, 288
Caph, 31, 37, 38
Capricornus, 137, 139; diagram of, 137
Cassiopeia, 29, 30, 32, 33, 34, 37, 38, 40, 45, 63, 66, 71, 75, 148, 149, 210, 281, 283; diagram of, 28; "M" shape, 29; "W" shape, 30, 283
Castor, 171, 172, 173, 174, 211
Catalcgue, Messier's, 329
Caucasus, Mt., 317
Celæno, 115
Celestial sisters, the, 233
Centaur, Chiron, 322
Centaurs, the, 335
Central America, 24
Cephalos, 186
Cepheus, 32, 37, 38, 40, 45, 46, 75, 148, 210, 281, 283; diagram of, 36
Cerberus, 238
Cetus, 33, 195, 198, 201; diagram of, 194
Chair, Lady in the, 31
Chaldeans, the, 139, 269
Champion, the, 63
Chara, 223, 224
Chariot, inventor of, 219
Charioteer, the, 55, 59, 140, 210
Charles' Heart, 223
Chickens, Pleiades likened to, 117
Chimæra, the, 123
China, 111
Chinese, 41, 104, 158, 167, 246; legend of Magpie Bridge, 306; name for Corvus, 257; Delphinus, 213; Alpha Herculis, 238; Vega, 289; notion of Libra, 340; Milky Way, 346
Chiron, 239, 322, 334, 335
Christ, Jesus, 99; Cross of, 313
Christmas eve, 298
Circlet, the, 89, 127
Citlal Cholcha, 366
City of Dragon, 49, 50
Clark, Alvan G., 186
Claws, the, 268
Cluster of stars in Cancer, 268; 35 M., 172; in Hercules, 238; Perseus, 66
Clymene, 202
Coal Sacks in Milky Way, 298, 323, 334, 344
Coffin, Job's, 311
Colca, 57
Colchis, 85, 172
Columbus, 377
Coma Berenices, 227; diagram of, 226
Comet, Biela's, 73
Conon, 228
Copernicus, 361
Cor Caroli, 223, 224, 250, 257
Cord, the, 90
Cor Hydræ, 273
Corona Australis, 334
Corona Borealis, 231; diagram of, 230; Indian legend of, 234
Coronæus, 258
Coronis, 258
Corvus, 257; Delta in, 257; diagram of, 256

Council of Chiefs, 234
Crab, the, 267, 268
Crater, the Cup, 257, 263, 264; diagram of, 262
Craters of the Moon, 369
Crescent Mercury, 361
Crete, 233; King of, 60
Cross of Jesus Christ, 313
Cross, the Northern, 297; Southern, 297
Crow, the, 166, 167, 257, 258, 259
Crown, the, 231, 232, 234, 238, 322; Ariadne's, 233; Northern, 231, 321; Southern, 334
Cyclops, the, 160
Cygnus, 297, 299; Arab name for, 300; Beta, 299; diagram of, 296; legends of, 299; sixty-one, 299
Cup, the, 257, 263; and Snake, 259; of Apollo, 264
Cupid, 90, 91
Cupid's Arrow, 317

D

Dabih, 138
Damsel, the Spinning, 306
Danæ, 67
Dante, 137
Dardanelles, 85
Dardanus, 116
Daze, legend of, 174
Deer, the Red, 97
Delphinus, the Dolphin, 122, 311; diagram of, 310
Delta, 81
Delta Cephei, 39; Corvi, 257; Herculis, 297
Demeter, temple of, 134
Denderah, Her Majesty of, 184; temple of Hathor at, 49
Deneb, 297, 298, 299, 303, 334; Arab name for, 298; color and distance of, 299
Deneb Algedi, 139; Kaitos, 196
Denebola, 250, 251, 257, 267, 274; distance of, 251
Diamond, the big, 121; of Virgo, 250
Diana, 159, 160, 161, 190
Dipper, the Big, 5, 7, 14, 15, 16, 215, 282, 352; Little, 110, 148, 283; Milk, 333
Discovery of Neptune, 382
Dish, the, 232
Dog, days, 185; the Great, 158, 184; star, 211
Dolphin, the, 90, 122, 311
Double-Eye, 66
Double Stars, Alpha Libræ, 339; Beta Cygni, 299
Doves, Pleiades likened to, 115
Draco, 45, 47, 50, 148, 149, 210, 281, 283; diagram of, 44
Dragon, the, 45, 47, 50, 51, 210, 237, 283; city of the, 49
Dragon's head, 48, 55
Driver, the, 57
Dryden, 24
Dubhe, 15, 37, 81
Dyaks, 118

E

Eagle, Aquila the, 300, 303, 306, 311; flying, 300; hunting, 307; swooping, 300
Ear of Wheat, 244
Earth, 367; reflects sun's light, 368; seasons of, 368
Easter celebration, 99
Egypt, 49, 58, 91; Euergetes, King of, 228
Egyptians, 34, 48, 49, 91, 99, 111, 128, 184, 254; conception of Hyades, 275; mythology, 245; notion of Milky Way, 346; notion concerning Mercury, 362; rising of Crater, 264; temple to Spica, 244; Vega, 289
Eleusis in Greece, 134
Electra, 115, 116
Elbow, the, 64
Ell, the, 158
Eltanin, 48, 49
Emperor's Throne, the, 238

England, 14; Astronomer Royal of, 382; name for Crater in, 264; Royal Arms of, 254
Enif, 122
Ephyre, King of, 123
Epsilon, Lyræ, 289; Virginis, 245
Equator of the heavens, 129
Equuleus, 122
Equus, 122
Erichthonius, 59, 219
Eridanus, 201, 203, 299, 329, 345; diagram of, 200
Erigone, 190
Eros, 375
Er Rai, 37, 39, 47
Eskimos, 34, 115, 158, 216
Eta Aquilæ, variable star, 304; Ursæ Majoris, 227
Ethiopia, 76; King of, 32
Ethiopians, 203
Eudora, 104
Eudosia, 321
Euergetes, 228
Euphrates River, 91, 202
Europa, 377; story of, 99, 100
Europe, 85
Eurydice, 291, 292
Eurytheus, 239
Evil one in the Garden of Eden, 51

F

Fabricius, Dr., 196
Fairies' Path, 347
Falling Vulture, the, 289
Favorable Judge, 48
Female Warrior, 157
Festival, May Day, 99; of Tanabata, 307
Fiddle in the Sky, 292
Field of the Nebulæ, 246
First star in Aries, 82
Fishes, the, 89, 90, 91, 127
Fish-hook of Maui, 328
Flaxen thread, 90
Flying Eagle, the, 300
Fomalhaut, 251
Fortunate one, 138
Frederick's Glory, 74
Freud's legend of Milky Way, 346
Furrow of Heaven, 97

G

Galilee, Lake of, 14
Galileo, 364; observations of Jupiter's moons, 377, 378
Galle, 383
Gamma, Leonis, 251, 267; Leporis, 166; Virginis, 244
Ganymede, 129, 306, 377
Garden of Eden, 51
Garnet star, 38
Gate of the gods, the, 139
Gemini, 171, 179, 211; diagram of, 170
Gemma, 232, 238
Ghizeh, in Egypt, temple of, 48
Giansar, 45, 47
Giant Hunter, the, 97, 153, 154, 155, 156, 159, 160, 165, 167, 179, 190, 329
Giant's Belt, the, 154; eyes, 172, 174; head, 158
Gienah, 257
Glass Sky, 12
Glaucus, 123
Gloria Frederika, 74
Goat's Head, 138
Goatherd, 58
Goat star, the, 57, 210
Goddess of Justice, 245, 339
Gods, Swift Messenger of, 359
Golden, apples, 50; fleece, 41, 85
Goodricke, 65
Gorgons, the, 67, 68
Grape Gatherer, 245
Great Bear, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 23, 29, 37, 47, 55, 116, 147, 149, 216, 224, 243, 249, 282
Great Bear's tail, 227
Great, cluster in Perseus, 66; Dog, 165, 183; Pyramid of Cheops, 48; Square of Pegasus, 72; Storm Bird, 258
Greece, 40, 49; temples of, 82, 173
Greek, alphabet, 218, 282; church, sects of, 313; fables, 253, 258; idea of planet

Greek—*Continued*
Venus, 365; legends, 59, 90, 99, 129, 322, 334, 340; letter star names, 10, 268; name for Aquila, 306; Cygnus, 300; Mercury, 361; notion of Milky Way, 345; word for Planets, 355
Greenland, meteor from, 252
Greenlanders, the, 158
Guardian of the Pleiades, 57; Pole, 19, 20, 149, 288; Sky, 97; Stars of Heaven, 251
Gulf of Mexico, 201
Gulf Stream, 201

H

Hadrian, Emperor, 306
Hall, Dr. Asaph, 374
Hamal, 81, 82, 95
Hand, the, 165, 166
Hare, the, 31
Hare in the Moon, 167
Harp, the, 291; King Arthur's, 292; star, 289
Hathor, 111; temple of, 49
Head of Woman in Chains, 72
Hearn, Lafcadio, 307
Heart of Brahma, 58
Heaven, Guardian stars of, 251
Hebe, 240
Hebrews, name for Corvus, 257; notion concerning Libra, 340
Hebrus, River, 292
Helicon, Mt., 122
Helle, 85
Hellespont, 85, 173
Hercules, 237, 238, 239, 253, 274, 292, 317, 321, 335, 346; Alpha in, 238; Delta in, 97; cup of, 264; diagram of, 237; great cluster in, 238; keystone in, 238; and Lernæan monster, 269, 270; worship of, 238
Herdsman, the, 215, 218, 237, 307
Herschel, Sir John, 172; William, 347
Hesperides, 50
Hesperus, 365
Hiawatha, 344
High One of Enclosure of Life, 48
High Horned One, 48
Hind's crimson star, 166
Hindus, 104, 111, 158; name for Venus, 366
Hippocrene, Spring of, 123
Hobby horse of Sagittarius, 334
Homer, 159
Hooke, Dr., 49, 82
Horn of Plenty, 57, 140
Horn Star, 82
Horse, the, 121; and Rider, 14; winged, 72, 96
Horse's shoulders, 122
Horus, 362
Hottentots, the, 112
Hunter, the, 160
Hunting Dogs, the, 223; Eagle, 307
Hyades, 96, 100, 103, 104, 105, 110, 114
Hyas, 104
Hydra, 263, 268, 273, 274, 275; diagram of, 272; heart of, 273; Pi in, 274
Hymn to North Star, 25

I

Icarius, cup of, 264
Ida, Mt., 129
Idas, 173
Identifying planet Saturn, 379
Iliad, 365
India, 57, 340
Indians, 234; Algonquin, 344; Amazon River, 157; American, 112; Iroquois legends, 12, 116; Pawnee, notion of Milky Way, 346; Shasta legend, 114; Shawnee, 233; stories about Pleiades, 11; story of Little Bear, 23
Inner throne of five Emperors, 41
Interferometer, 156
Io, 377
Iolaus, 274

Iota, Cancri, 269; Cephei, 40
Iroquois Indian legends, 12, 116
Ishtar, 365
Isis, 49, 245
Islanders, Polynesian, 328

J

Japanese, 111; festival of Tanabata, 307; name for Vega, 289; notion of Milky Way, 346
Jason, 41, 85, 172, 335
Jaw of an ox, 104
Job's, Coffin, 122, 311, 313; Star, 216; temple of, 270
Judea, 346
Judge of Heaven, 48
Juno, 239, 269, 270, 329, 346
Jupiter, god, 11, 140, 172, 174, 240, 245, 254, 258, 299, 306, 317, 335
Jupiter, Planet, 376; habitability of, 377; identifying, 375; discovery of moons of, 377; Galileo's observations of, 377; size of, 376; symbol of, 378; weight of, 377
Justice, Goddess of, 245, 339

K

Keeper of Heaven, 216
Keystone of Hercules, 238
Kids, the, 58, 60; two, 172
Killer, the Bull, 335
King Arthur's Harp, 292
King, the, 250, 283
King of Athens, 59; Crete, 60; Ethiopia, 32, 40; Ligurians, 299; Planets, 378; Seriphus, 67; Sky, 38; Sparta, 299; Suns, 184
King Star, 250
Kings, the three, 158
Kingsley, Charles, 76
Kneeler, the, 237
Kneeling One, the, 238
Korea, 307
Korean legend, 306

L

Lady in the Chair, 31
Lalande, 64
Lamp, stone, 34
Laocoön, 323
Latin's name for Gamma Virginis, 244
Leda, 172, 299
Ledean lights, 173
Leg, the, 34
Legend, Basque, 13, 14; Chinese, 306; concerning Cygnus, 299; French, of Milky Way, 346; Greek, 334; of Ophiuchus, 322; regarding Libra, 340; Iroquois Indians, 11, 116; Korean, 306; Shasta Indians, 114; Zuni Indians, 13
Leo, 249, 250, 253, 254; diagram of, 248; meteor shower in, 252; Regulus in, 274; Leonid meteors, 253
Leonis, Gamma, 251, 267
Lepus, 165, 183; diagram of, 164
Lerna, marshes of, 274
Lesbos, 311
Lesuth, 329
Leucippus, 173
Leverrier, Urbain, 382
Libra, 339; Alpha in double star, 339; diagram of, 338; Greek legend of, 340
Life of Heaven, 48
Light Bearer, the, 365
Light, speed of, 185, 288
Ligurians, King of, 299
Lion, the, 249, 254; tail of, 251
Little, Bear, 11, 19, 47, 110, 148, 209, 210, 305; Cloud, 74; Dipper, 19, 209, 280; Dog, 189; Horse, 122; She Camels, 104
Long Bandage, a, 346
Longfellow, H. W., 155, 279, 344
Lowell, J. R., 20, 287
Lucan, 24
Lucifer, 365
Lucky One of the Slaughterers, 138

Lybia, 68
Lycia, 123
Lynceus, 173
Lyra, 210, 287, 288, 290, 291, 292; and Aquila linked, 306; Beta in, 290; Bohemian name for, 292; Britons' name for, 292; diagram of, 286; Epsilon in, 289; meteors from, 292; parallelogram in, 287
Lyre, the, 238, 287
Lyrid meteors, 293

M

"M" shape of Cassiopeia, 149
Macrobius, 269
Magnitude of stars, 305
Magpie Bridge, 306, 346
Maia, 115
Maiden, the Spinning, 289
Malays, 117
Manger, the, 268, 269
Manilius, 85, 103, 133, 153, 155, 171, 215, 343
Marfak, 31, 37, 63
Marius, Simon, 74
Markab, 122
Mars, the Planet, 373; day of, 373; distance of, 373; habitability of, 374; moons of, 374; polar caps of, 374; and red stars, 373; rival of, 328; size of, 373; symbol of, 374; year of, 373
Martial, 172
Martin, Mrs., 304
Maui, Fish-hook of, 328
Mauretania, King of, 104
May Day festival, 99
May Pole, 99
Medea, cup of, 264
Medusa, 67, 68, 122
Medusa's Head, 66, 67, 76, 77
Megrez, 37, 81
Meissa, 158
Melkarth, 238
Menkalinan, 58
Menkar, 190
Merak, 15
Mercury, god, 59, 68, 85; god of Day, 361; Thieves, 361
Mercury, the Planet, 359; crescent, 361; distance from sun, 359; Egyptian idea of, 362; Greek name for, 361; Indian idea of, 362; size of, 359; the sparkling one, 362; symbol of, 362; when best seen, 360; year of, 359
Meredith, 223
Merope, 115, 160
Messier, 172, 329
Meteor from Greenland, 252
Meteors, 66, 73, 252; Bielid, 73; Lyrids, 292, 293
Mexican temples to Venus, 366
Michelson, Professor A. A., 156
Mighty, the, 250
Milk Dipper, 333
Milky Way, the, 31, 32, 63, 189, 232, 246, 297, 298, 306, 317, 323, 334, 343, 344, 345, 346, 347; coal sacks in, 344; course of, 343, 344; French legend of, 346; Japanese myth of, 346; ancient Britons' idea of, 346; Armenian, 346; Chinese, 346; Egyptian, 346; Greeks, 345; Judeans, 346; Pawnee Indian, 346; Peruvian, 346; number of stars in, 347
Milton, 33
Minerva, 50, 59, 68, 91, 122, 123, 258
Minotaur, the, 233
Mintaka, 157
Mira, 196
Mirach, 71, 72
Mirak, 218
Mizar, 14, 29
Mochus, 340
Monoceros, 179, 180; diagram of, 178
Montanari, 65
Moon, 227, 369; craters of, 369; dark spots on, 370; dimensions of, 369; distance from earth, 369; goddess, 161; phases, 370; and weather, 371

Moons of Jupiter, 377; Mars, 374; Saturn, 380; Uranus, 381
Moore, 23
Moses, 322
Mount, Caucasus, 317; Olympus, 292
Mt. Wilson Observatory, 156
Mouth, the Fish's, 133
Museum of Natural History, N. Y. C., 252
Mythology, Egyptian, 245

N

Names of Jupiter's moons, 377
Nashira, 138
Nath, 59, 98
Navigators, first, 24
Nebula, 74, 75; Andromeda, 74, 75; Orion, 159; Ring, 289, 290
Nebulæ, Field of, 246
Nemæa, 253
Neptune, the god, 32, 75, 122, 258, 300, 311
Neptune, the Planet, 382; discovery of, 382, 383; distance from sun, 382
Newcomb, Professor Simon, 157
New York City, 64, 65, 73, 252
Nile River, 128, 140, 184, 202, 254, 264, 275, 306; flood of, 254; rising of, 254
Nineveh, temples of, 365
Noah's wine cup, 264
Norsemen, the, 129
North America, 234
Northern Crown, the, 231, 297, 321
North Pole, 8
North Star, 15, 19, 20, 72, 148, 209, 282; hymn to, 25
Norse, the, 122
Nova, Aquilæ, 307; Coronæ, 232; Persei, 66
Novæ, 30
Nuts, the golden, 158
Nymphs, sea, 32

O

Œnomaus, 59
Œta, Mt., 239
Olympus, Mt., 292
Orion, 97, 115, 117, 153, 154, 155, 157, 158, 159, 160, 161, 171, 178, 186, 201, 329, 333; Bands of, 158; diagram of, 152; Dog of, 183; Nebula in, 159
Orpheus, 291, 292, 299
Ophiuchus, 321, 322, 323, 327; diagram of, 320; Greek legend of, 322
Ovid, 11, 122, 327
Ox Driver, 218

P

Palace of Heaven, road to, 345
Pan, the god, 140
Parallelogram in Lyra, 287
Parmenides, 366
Path, the Fairies', 347
Path of the Zodiac, 352
Pawnee Indians' idea of the Milky Way, 346
Peacocks, the Two, 172
Pearls, the string of, 158
Peary, Commander, 73, 252
Pease, Mr. Francis G., 156
Pegasus, 72, 89, 96, 109, 121, 122, 123, 137; diagram of, 120; Great Square of, 72, 121
Periander, 312
Perseus, 33, 34, 63, 67, 68, 71, 76, 77, 109, 122, 198; cluster in, 66; diagram of, 62; segment of, 63
Persia, 97, 99; Royal stars of, 328
Persians, 90, 133, 251
Peru, 111
Peruvians, 57, 112; idea of Milky Way, 346
Phad, 55
Phaëthon, 202, 203, 299, 329, 330
Phantom, the, 238

Phaola, 104
Phases of the Moon, illustration of, 370
Philyra, 334
Phocis, King of, 258
Phœbe, 173
Phœbus, 202
Phœnicia, 99, 238
Phœnician, name for Lyra, 292; worship of Hercules, 238
Phosphor, 365
Phrixus, 85
Pi in Hydra, 274
Piazzi, 313
Pigs, the three, 158
Pirene, fountain at, 123
Pisa, King of, 59
Pisces, 89, 122; diagram of, 84
Piscis Australis, 128, 133
Planets, 355; color of, 383; Greek word for, 355; habitability of, 356; identifying, 352, 357; King of, 378; names of, 357; reflect sun's light, 356; and stars, 383; in Zodiac, 352
Pleiad, the lost, 116, 117
Pleiades, the, 96, 100, 104, 105, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 195; Guardians of, 57; Mystery of, 111
Pleione, 114
Pliny, 269
Plough, the, 14, 219
Pluto, 67, 291, 322
Pointers, the, 15, 16, 37, 45, 209, 223, 249, 282, 361; distance between, 352
Polar caps on Mars, 374
Polaris, 15, 19, 20, 21, 22, 23, 24, 25, 29, 33, 37, 38, 45, 47, 55, 64, 81, 82, 148, 149, 153, 211, 232, 249, 251, 282, 283, 305; Arab name for, 24
Pole, the, 8, 50, 280; how to locate, 15, 16; Guardians of, 19, 283
Pole Star, 15, 23, 24, 47; Vega, the, 289
Polish Bull, 322
Pollux, 171, 172, 173, 174, 189, 211
Polydectes, 67, 68
Polynesian Islanders, 328
Polyxo, 104
Pompeii, 49
Poniatowskia, Bull of, 322
Po River, 203, 345
Porrima, 244
Pot, two-handed, 264
Præsepe, 268, 269
Precession, 289
Prince of Celestial Signs, 84
Proclaimer of Light, 48
Procyon, 189, 191
Prometheus, 317
Prosperity, Star of, 244
Pulcherima, 218
Punishment, Crow's, 259
Pythagoras, 366

R

Rainy Goat Star, 58
Ram, the, 81, 82, 83, 84, 85
Ram's eye, 82
Ras Algethi, 238, 321
Ras Alhague, 321, 328
Rauhineya, 362
Raven, the, 166, 257
Red Bird, the, 257
Regulus, 250, 274
Reinholder, the, 59
Resurrection, the, 99
Rhea, 334
Rhodius, Apollonius, 231
Rhyme of the Zodiac, 84
Rigel, 156, 157, 165, 171, 201; distance of, 157; speed of, 157
Right Arm, 38
Ring around the Rosy, 20
Ring Nebula, 289, 290
Rings of Saturn, 380
Rival of Mars, 328
River, the, 201; Euphrates, 91; in the sky, 166; Po, 203, 345
Road to the Palace of Heaven, 345
Rohini, 97
Roman, fleet, 161; title for Libra, 339
Romans, the, 173; name for Corvus, 257

Rome, Vatican at, 323
Royal, Arms of England, 254; family of Starland, 40
Royal Stars, 97, 134, 251; of Persia, 328
Ruchbah, 31

S

Sacks, Coal, 298, 323, 334
Sadal, Melik, 129; Suud, 129
Saddle, the, 122
Sagitta, 317
Sagittarius, 333; diagram of, 332; Greek legend of, 334; Hobby Horse of, 334
Saiph, 165
Satan's Head, 66
Saturn, the Planet, 379; distance from sun, 379; length of day and year, 379; moons of, 380; rings of, 380; size of, 379; symbol of, 380
Saviour, the, 14
Scales, the, 339
Scarborough, Sir Charles, 223
Scheat, 122
Schedar, 122
Scorpion, the, 159, 327, 329, 330; heart of, 328; Novæ in, 330
Scorpius, 97, 327; diagram of, 326
Sea, the, 90
Sea Goat, the, 90, 137, 140
Seal Hunters, the three, 158
Sea Nymphs, 30
Secunda Giedi, 138
Segment of Perseus, 63
Seriphus, King of, 67
Serpentarius, 321
Serpent, Brazen, 322
Serpent Charmer, head of the, 321
Serviss, Mr. Garrett P., 227, 246, 249
Set, 362
Shakespeare, 25
Shasta Indian legend, 114
Shaula, 329
Shawnee Indians, 233
Shepherd, the, 39
Sheratan, 82
Shower, meteor, in Leo, 253
Sickle, the, 249, 251, 252, 267
Side, the, 63
Sigma Orionis, 158
Sign, the, 82
Sigourney, Mrs., 97
Simal, 82
Singer, the, 57
Sirius, 158, 161, 165, 183, 184, 185, 186, 189, 191, 211
Sisters, the Celestial, 233
Sixty-one Cygni, distance of, 299
Sky, Arc-light of, 287; Fiddle in, 292
Snake, Cup and the, 259; Water, 268
Solitary one, the, 273
South, Africa, 111; America, 111; map of, 129
Southern, Cross, the, 297, 334; Fish, 128; Gate of the Sun, 139
Sparkling One, the, 362
Sparta, King of, 299
Spectre's Head, the, 66
Spica, 243, 257, 274; distance of, 244; Queen star of Spring, 244
Spinning, Damsel, 306; Maiden, 289
Star, Blaze, 232; in Chayre, 30; cluster in Cancer, 268; colors, 98; Goat, 57; Harp, 289; King, 250; names, Greek letter, 10, 268; Pilgrim, 30; of Prosperity, 244; Stranger, 30; Tycho's, 30; variable, in Lyra, 290
Starry Meadow, 246
"Stars, the Friendly," 304; identifying Planets from, 383; magnitude of, 305; in Milky Way, 347; Royal, 97, 251, 328
St. Elmo's lamps, 173
Sterope, 115
Storm Wind, the, 258
Stranger Star, 30
Street, Watling, 347

Struve, 218
Sukra, Hindu name for Venus, 366
Sun god, 160
Swan, the, 297, 300, 311, 334
Swooping Eagle, the, 300
Symbols of Jupiter, 378; Mars, 374; Mercury, 362; Saturn, 380; Uranus, 381; Venus, 366; Zodiac, 351
Syrians, the, 90

T

Tail, the, name for Deneb, 298; Lion's, 251
Tanabata, Festival of, 307
Taras, 312
Tarentum, City of, 312
Tartessus, 68
Tau Ceti, distance of, 197
Taurus, 59, 95, 99, 100, 201, 335; diagram of, 94
Taygeta, 115
Taylor, Bayard, 110
Tears of St. Laurence, meteors, 66
Telaria, 173
Telescopes, 173
Temple of Hathor, 49
Temples, Egyptian, 49, 184, 244; Grecian, 82; of Nineveh, 365; to Venus, Mexican, 366
Tennyson, Alfred, 56, 100, 110, 158, 183
Theban, Hercules the famous, 239
Thebes, 49
Themis, 245
Theseus, 233
Thessaly, King of, 85
Thuban, 47
Todd, Professor D. P., 370
Tongareva, 328
Topelius, 185
Torch, a, 103
Tortoise, Phœnician name for Lyra, 292
Triangular Spoon, 103
Triangulum, 81
Troy, 323
Turkish name for Aquila, 307
Turks, 90
Twins, the, 171, 172, 173, 174, 211
Two-handed Pot, the, 264
Tycho's Star, 30
Tyndarus, 299
Typhon, 91, 134, 140, 246

U

Unicorn, the, 179
Unuk al Hay, 322
Uranus, the Planet, 381
Ursa Major, 5, 209, 281, 282; Beta in, 223; Eta in, 227
Ursa Minor, 19, 20, 110, 209, 281, 283, 305; diagram of, 18

V

Valentine, St., 317
Variable stars, 39, 40, 197; Beta Lyræ, 290; Eta Aquilæ, 304; Omicron Ceti, 196
Vatican at Rome, 323
Vega, 98, 210, 231, 238, 287, 288, 289, 297, 303, 304, 307; Arab name for, 289; Chinese name for, 289; color of, 287; distance of, 288; Japanese name for, 289; the Pole star, 289; worship of, 289
Venator, 313
Venice, Ducal Palace in, 100
Venus, the goddess, 90, 91, 134, 202, 376
Venus, the Planet, 363; Arabian worship of, 366; distance of, 363; earliest observations of, 364; Greek idea of, 365; first identified, 366; length of day and year of, 363; Hindu name for, 366; how to recognize, 364; Mexican temple to, 366; South American name for, 366; size of, 363; symbol of, 366; telescopic view of, 364
Vernal Equinox, the, 89, 99

Veronese, Paul, 100
Vesper, 365
Vesta, the asteroid, 375
Vindemiatrix, 245
Virgil, 201, 340
Virgin, the, 243, 246, 250, 257
Virginis, Epsilon, 245; Gamma, 244
Virgo, 243, 245; diagram of, 242; Diamond of, 250
Vulcan, 59, 160
Vulture, the falling, 289, 300

W

"W" shape of Cassiopeia, 30
Wain, the, 14, 219
Wali's Palace, 129
Wanjil, 176
Warwick Collection, 264
Water, Carrier, 128; Jar of Aquarius, 127, 128; Snake, the, 268, 273
Watling Street, 347
Weather, moon's effect on, 371
Weaver, the, 307
Weighing beam, the, 158
Western Fish, the, 89
Whale, the, 90, 195, 196, 198, 201
Wheat, Ear of, 244
Whip, a, 31
White Hawk, 234
Whitman, Walt, 216

Y

"Y" inverted in Cancer, 267, 268, 273
Yard, the, 158
Yellow Road, the, 246
Yurree, 176

Z

Zeta Cancri, 269
Zeus, 322; Bird of, 306
Zodiac, 82, 83, 84, 89, 90, 96, 98, 128, 137, 171, 245, 250, 254, 267, 327, 333, 339, 351, 367, 373, 378, 383; divisions of, 351; how divided, 83; leader of host of, 84; path of, 352; Prince of, 84; rhyme of, 84; symbols of, 351
Zoharah, Arab name for Venus, 366
Zuni Indian legend, 13

Date Due

Oct. 7	MAY 18 '70		
Oct. 8	DEC 19 '70		
Oct. 14			
Oct. 21			
Oct. 25			

523.8 Olcott 1181
O
Book 2 stars

Highland Central School Library

HIGHLAND, N. Y.

1. All pupils in the school are entitled to use the library and to draw books.

2. Reference books, such as encyclopaedias and dictionaries, are to be used only in the library.

3. Reserved books may be borrowed for one period, or at the close of school, and should be returned before the first class the following school day.

4. All other books may be retained for two weeks.

5. Two cents a day is charged for each book kept overtime.

6. Injury to books beyond reasonable wear and all losses shall be paid for.

7. No books may be taken from the library without being charged.